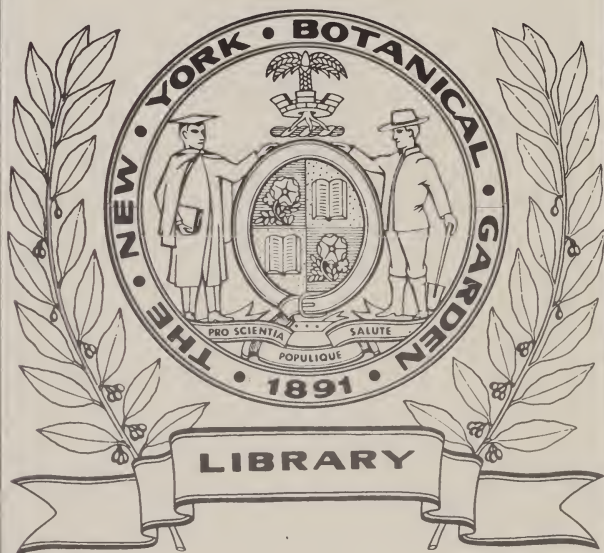
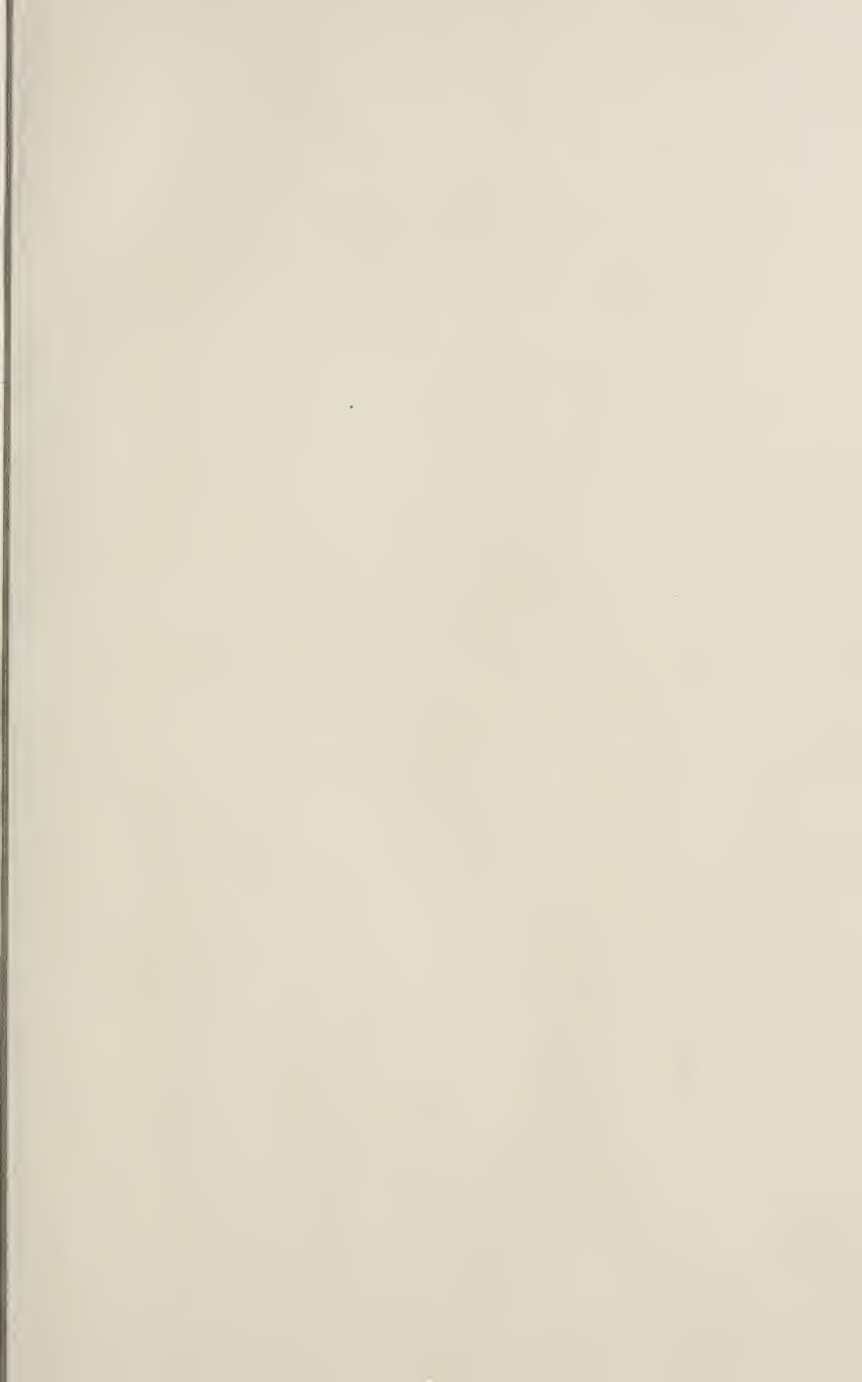


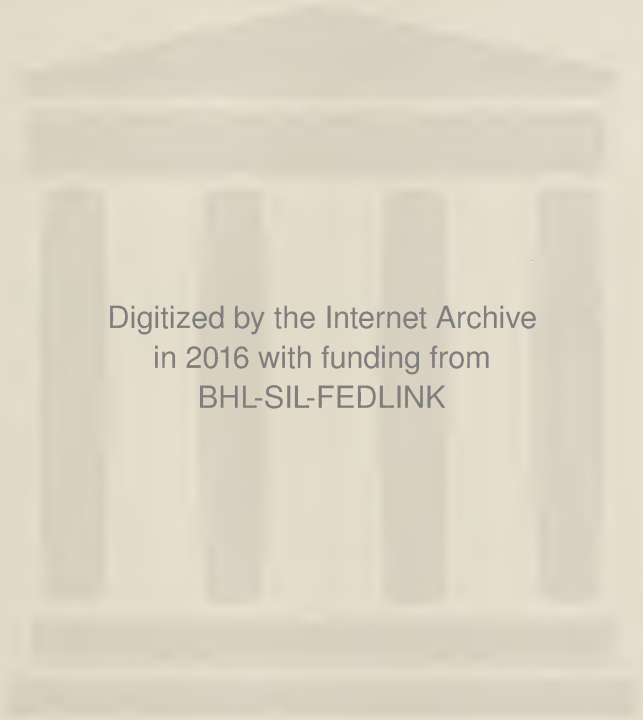
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THE FERNS OF SOUTH AFRICA



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THE FERNS OF SOUTH AFRICA

CONTAINING
DESCRIPTIONS AND FIGURES
OF THE
FERNS AND FERN ALLIES OF SOUTH AFRICA
WITH LOCALITIES, CULTURAL NOTES, &c.

ONE HUNDRED AND FIFTY-NINE PLATES

BY
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CURATOR—BOTANIC GARDENS, KING WILLIAM'S TOWN, S. AFRICA

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PREFACE.

THE vast and varied flora of South Africa, despite the beauty and usefulness of many of its species, has always received from the general public, an exceedingly small amount of attention, and still continues to do so.

There have been a few men who have made themselves acquainted with the floras of their own districts ; there have also been a very few who have in some measure mastered the main features of the whole flora of South Africa ; but even now the beginner who hopes to receive assistance from earlier botanists must soon discover that the plants themselves are much more easily found, than is their written history.

Descriptions of species from many pens and in several languages have been scattered through numerous books and journals during the past hundred years, but some of these are not now obtainable. Some unpublished species named in manuscript are known only by single specimens hid away in European herbaria, and the work of compiling from these scattered data a *Flora Capensis*, begun in 1859 by Harvey and Sonder, is not yet half done, and has small chance of being completed in the near future.

The present work is one step in that direction. By

taking in hand one group of orders, and collecting from all sources available in South Africa, such information as seemed desirable for the end in view, I hope that I have been able to prepare a work which will lessen to a considerable extent, to future students of this subject, the difficulties that have hitherto presented themselves ; and which will give, in a collected form, most of the particulars required.

Such a work must necessarily be in part compiled from previous writers, and I have, throughout, given the authorities quoted.

The whole of the descriptions, however, as well as the figures, are my own, and taken from live specimens where these were obtainable, or from dried specimens in my own herbarium, or in some of the leading Cape herbaria.

In the cases where all these were defective, the authorities of Kew have, with their constant willingness, assisted greatly by sending specimens collected in this or other countries of what were known or recorded to be South African species.

The earlier chapters are reproduced from my "Hand-book of Kaffrarian Ferns," but altered so as to meet the wider area ; and most of the plates prepared for that work are again used here.

The synonyms given are mostly what occur in works on African plants, and do not by any means exhaust the list of names applied to some of the species.

Without a visit to Europe, it is of course impossible for me to verify all these synonyms, but I have found occasion in a good few cases to differ from Kuhn, mostly regarding species originated by Pappe and Rawson.

In connection with the distribution of species it may be remarked here, that localities which are now in the Transvaal have, by Sanderson and others, been marked "Natal," before the Transvaal existed, and that some confusion has been caused thereby ; also, that "the Cape" is occasionally given for localities which are now outside Cape Colony.

Among those who have given great assistance, my best thanks are due to W. T. Thistleton Dyer, Esq., C.M.G., F.R.S., F.L.S., Director of the Royal Gardens, Kew ; and J. G. Baker, Esq., F.R.S., F.L.S., Keeper of the Herbarium there, for the specimens already mentioned, and for notes on other South African Ferns as represented in the Kew Herbarium ; to Prof. MacOwan, B.A., F.L.S., Botanist to the Agricultural Department, and Curator of the Government Herbarium, Cape Town ; and Dr. Schönland, F.L.S., Curator of Albany Museum, Grahamstown, for kind assistance while examining the Herbaria in their charge ; to H. Bolus, Esq., F.L.S., for the use of his splendid Herbarium and Library ; to J. M. Wood, Esq., A.L.S., Curator of Durban Botanic Garden, and of Natal Government Herbarium, for a fine set of specimens of Natal ferns ; to H. G. Flanagan, Esq., Komgha, for a similar set of the ferns of his district ; and to all the other Ladies and Gentlemen who have assisted with specimens, most of whom are mentioned on pages 20 and 22 ; also, to John Roy, Esq., LL.D. ; and John Bulloch, Esq., both of Aberdeen, Scotland, for most kindly seeing this work through the press in my absence, as they previously did my "Handbook of Kaffrarian Ferns." Thanks are also due to

J. Ffolliott Darling, Esq., of Umtali, for a parcel of 25 species collected in Mashonaland, which came to hand after all the rest of the book had gone to press, and which as the ferns of that distant region are previously unrecorded, I am very pleased to be able to enumerate in an appendix. As this parcel contains several species from South Africa, previously unrecorded, except by Sanderson, it should encourage some of the now numerous visitors to Mashonaland to send down specimens of what may come in their way, and I shall be gratified to receive and report upon whatever may be so sent.

I do not anticipate that many more species of Ferns will ever be found in Cape Colony, but the whole region north of the Orange, Vaal, and Umvolosi Rivers is still botanically, almost a *terra incognita*, and doubtless contains many still unrecorded species.

T. R. S.

King William's Town,
August, 1892.

FERN S.

THE plants included in this work form, together, a group known to botanists as *vascular cryptogams*, and have certain characters in common by which they are distinguished from other groups of plants, but, among themselves they present a considerable range of variation in structure, and no one who knows a little of botanical classification would think of associating with ferns such plants as Marsilia, Isoetes, or Psilotum. The connection will be explained further on; but restricting ourselves meantime to the ferns, though most readers are familiar with them as a group, there are many who, while they recognise a plant as a fern, can give no definite character which identifies it as such, or which distinguishes it from other plants resembling ferns. This is not because they possess no such character, but rather because their reproductive parts are so small as to be difficult to understand aright. Anyone who examines a fertile frond of the common Bracken will find that the margin all along is closely folded back upon the underside of the frond, and that under this reflexed edge there are numerous small bodies which, when examined by a magnifying glass, are found to be cases containing abundant dust-like particles, differing in structure from true seeds, but generally supposed to act as such. If the common scented fern be examined, it will be found to have these seed cases, or *capsules*, as they are called, under the reflexed edge all along the upper part of the frond only, while in the larger tree ferns, and in many other ferns, they are arranged in round dots which have certain fixed positions on the under surface of the frond.

In all ordinary flowering plants, where seed is produced, it is formed after the flower, and is the direct result of the sexual

fertilization of one part of the flower by pollen grains produced on another part of the same flower, or of a different flower of the same kind.

In the ferns, however, neither the seed-like capsules, nor the dust-like particles, or *spores*, contained in them are the result of sexual fertilization ; indeed, until after the spores are set free there is no flower or anything analogous to a flower, nor any sexual parts, produced on the fern, and from the first appearance of a young frond it bears these capsules and spores which grow simultaneously with it, and reach maturity also at the same time.

It is this production of reproductive spores, without flowers or sexual connection, that is used as the first division in systematic botany, separating plants into two groups, flowering, or *Phanerogams*, and flowerless, or *Cryptogams*, the latter including, besides the plants now under study, such plants as mosses, lichens, seaweeds, and fungi, or mushrooms.

The further life history of the spores will be explained further on, but enough has been said to distinguish clearly between a fern and a more highly developed plant.

There remains, however, the difficulty that these parts are too minute for examination, except under a powerful microscope, and some readers may want a distinction which they can see for themselves without the microscope. This is not obtainable in every case ; but with ferns a little practice will enable anyone to identify the regular lines, or dots of capsules, along the edge, or on the surface, of the underside of the mature fertile frond, but which are not to be found on the leaves of any flowering plant. Another easily seen character, which holds in all, except *Ophioglossum*, is the manner in which the young fronds lie rolled up before they unfold, *i.e.*, every frond is rolled inward like the mainspring of a watch, having the tip of the frond for its centre, and each curve outward, rather larger, and containing all the rest. The divisions of the frond are also folded in the same way. This is what is known as *circinate vernation*, and is almost confined to ferns, though it also occurs among the Cycads or Kaffir Breads, and several other plants.

We now come to the characters by which Cryptogams are divided into groups ; and here some knowledge of plant physiology is necessary.

If the leaf of a moss be examined under a powerful microscope, it will be seen to be, not a solid mass as it appears to the unaided eye, but composed of numerous little sacks, or cells, containing liquid, and pressing one another into more or less regular geometric forms. The frond of a fern examined in the same way, shows similar regular cells, seldom much longer than wide, and often roundish, square, or hexagonal.

If, however, a longitudinal section from the stalk of a fern frond be examined, it will be found to consist of very much longer cells; cells so long, indeed, as to form continuous tubes up the stalk, for the free passage of the water, &c., sent up by the roots. These long cells are known as *vessels*, and plants formed of this tissue are known as *vascular*. Now, this is exactly the difference between *cellular cryptogams* and *vascular cryptogams*—the former including lichens, algæ, and fungi, having cells only, while the vascular cryptogams, as well as almost all flowering plants, have vascular tissue throughout their stems, and leaf veins, along with cellular tissue which is most developed in thin leafy parts. The mosses form a somewhat intermediate group between the two, but the method in which these are reproduced, distinguishes them easily from the higher vascular cryptogams. We find, then, that the Vascular Cryptogams, or as they are familiarly termed, the ferns and fern allies, are plants, which reproduce by spores fertilised, only after they leave the parent plant, and that they have stems and veins formed of vascular tissue.

PARTS OF FERNS.

THE component parts of a fern differ considerably, both in formation and in purpose, from those of a flowering plant, and to avoid confusion distinctive names are applied to them. Very many different terms are in use, but as it is more useful to thoroughly understand one set of words, and adhere strictly to them, than to wander through the whole category, the terms here explained are those used in the descriptive pages following, and they are used only in the sense here explained.

A fern consists of roots, stem, and fronds, and the more minute parts situated upon these.

ROOTS are either wiry, or like very fine hair ; always present, but affording us almost no characters, and therefore they require to be carefully distinguished from the rhizomes, which are always characteristic.

STEM.—The stem in what are known as tree ferns is erect, and several feet high, bearing the fronds at its summit ; but a much more frequent form is for the stem to be prostrate on, or under, the ground, when it is known as a *rhizome*.

The *rhizome* may be stout and short, or, as in the Bracken, very widely creeping, slender, and sometimes branched. In some it is underground, in others creeping on the surface, and in others creeping over tree trunks. The *fronds* are sometimes scattered along the rhizome, and sometimes clustered at the growing point only—which is then known as the *crown*.

Some ferns have almost no rhizome, but the crown only, standing erect, like an undeveloped tree stem. In a few cases the fronds are jointed on to the rhizome, but most frequently the tissues of the stem and frond run gradually into one another without any joint.

FROND.—The leaf-like parts of a fern are known as fronds, and are connected with the stem by more or less evident *stalks*. When the frond is divided, the continuation of the stalk between the leafy parts is known as the *rachis*, and the same term is applied to its further continuation through the branches, while the still further continuations of it within the substance of the frond is known as *veins*. If the frond be undivided it is said to be *simple*, and if cut down to the rachis it is *pinnate*, and each division known as a *pinna*. When these pinnæ are cut down to the rachis the frond is *bipinnate*, or *2-pinnate*, and when the pinnæ of these are again similarly cut, the frond is *tripinnate* or *3-pinnate*, and a further repetition of this makes them *4-pinnate*.

If instead of being cut to the rachis they are only partly cut, they are *pinnatifid* instead of pinnate, and frequently a frond, or a pinna, is pinnate below, and only pinnatifid above.

When the pinnatifid lobes are very unequal as to size, and are sometimes reduced to a waved outline, the frond is said to be *sinuate*.

When the stalk of a frond forks into two pinnæ and these again into two, it is said to be *dichotomous*, as in the *Gleichenias*, where the main divisions are dichotomous, and the final cutting pinnate. When a frond is 2, 3, or 4-pinnate, the final or undivided race of pinnæ are known as *pinnules*. A *sinus* is the bottom of the cut separating two lobes.

CAPSULES occur either in lines, or bundles, which are known as *sori*, one line or bundle being a *sorus*. In many ferns the sorus is covered, when young, by a thin membranous covering known as the *indusium*, and when the sorus is *marginal* (in a line along the edge of the frond), this indusium is generally formed of the turned back margin, changed in texture more or less. Instead of this in some ferns the sorus is placed inside a little membranous cup known as the *involucre*, and this term is also used where, instead of the cup, there is only a scale placed under the sorus. In some other ferns there is no indusium or involucre whatever.

The sorus is generally placed on a vein, and the part of the

vein to which the capsules are attached is known as the *receptacle*, which in a few cases projects beyond the substance of the frond, and in a few others is sunk into it. The *capsule* is a roundish cell, sometimes tapering downward into a stalk (Plate V., Fig. d.), and in all our ferns except *Ophioglossum* it is surrounded by an elastic jointed ring which in some is placed horizontally, and in others vertically, but in all it seems to assist in opening the capsules for the exit of the spores.

SPORES are minute dust-like germs, from which young ferns of the same kind are produced in the manner explained in the next chapter.

Besides the above there are several other appendages, such as scales, hairs, glands, and woolly tomentum, which, though of less use to the plant, are of considerable value to us as a means of identification. The other terms used in the descriptions are explained in the glossary at the end of the book, and the parts of the allied plants are, in each case, explained in the description.

REPRODUCTION AND PROPAGATION.

THE spore is the natural reproductive organ of the fern, and its method of development is most curious and interesting, though difficult to examine on account of its small size. When released by the bursting of the capsule, it floats in the air until some damp spot is reached, when growth at once commences, and in two weeks the small green growth may be detected without the magnifying glass, and, if given suitable conditions, it continues to grow on till about half-an-inch long and wide, by which time it will have assumed the two-lobed shape shown in the young plant of *Pteris cretica*, figured.

At that stage it is termed the *prothallus*, and looks like a green lichen or liverwort, attached by minute hair-like roots to the ground. Its growth then ceases, but, if very carefully examined under a powerful microscope, a few small tubercles may be seen on the under side, just below the notch, and those who make this a special study will find that male and female organs are there produced, and that sexual *fertilization* is accomplished by them.

Instead of this resulting in seed, as happens among the flowering plants after fertilization, the product in this case is a young plant, which, growing like a bud out of the fertilized prothallus, soon produces fronds, then roots, and in a few weeks is fit to provide for itself, when the now useless prothallus gradually withers off. It is by this means that all seedling ferns found in the forests or raised in the nurseries are obtained, and occasionally they come up unexpectedly in the greenhouse of the amateur.

To obtain the spores artificially, dry some half-ripened fronds in paper for a few days, then crush and sift, keeping the fine dust

for sowing. Prepare a pot, as if for planting, giving plenty of broken brick drainage, covered with moss, on the top of which a layer of finely sifted sandy soil is placed. The pot is then placed in a saucer full of water, which finds its way up into the soil, making it all damp and fit for a growing place for the spores. The spores should be gently scattered over the surface, but not covered with any soil, as the moisture keeps them in place, and if the saucer be filled up occasionally no watering over-head will be required, but a piece of glass should be laid over the pot so as to retain the moisture better. Care should be taken that spores only are sown, and not pieces of broken frond, or empty capsules, as these, decaying, often start a mould which carries off the young plants. The pot may then be placed in any dark, damp corner in a greenhouse, or frame, or even behind a wall, and should never be allowed to get either too dry, or too wet. When the young plants have about two to three fronds, they should be carefully transplanted an inch apart in fresh pots, as the first soil will likely have become a little sour, and when three inches high they may be potted singly. Some ferns persistently refuse to grow from spores; but whether this is owing to a defect in the spores, or to the want of proper conditions, still remains to be demonstrated.

There are several other methods of propagating some ferns besides by spores, such as by *buds* produced on the frond, by division of the rhizome, and, in rare cases, by buds produced on the roots. Buds produced on the frond are remarkable for the regularity with which they occur in the same part of the frond. Thus in *Asplenium monanthemum* the bud is a few inches up the stalk, in *A. erectum* it is at the tip of the frond, and in *A. gemmiferum* it is below the terminal pinnule. Some forms are seldom seen wild except bearing buds, and in the moist close forest this peculiarity seems to be even more developed than in cultivation.

Any form having long rhizomes may, with proper care, be propagated by division, but in several this is found to be most difficult, especially the *Gleichenias*, and the *Bracken*.

Some with short rhizomes produce several side buds if the terminal bud be removed, and with some others buds are produced

on the very base of the frond stalk, after the frond itself has been withered down for years.

The only kind in which buds are produced on the roots is *Hypolepis Bergiana*, which is so common that it is seldom examined, and consequently this is often overlooked.

CULTIVATION.

THE cultivation of some ferns is so easy, and their appearance as pot plants so graceful, that they have for years displaced most other plants for table decoration. The absence of flowers is no defect, but tends rather to add to their charms, for it allows them to be in season all the year round, and frequently a good fern, in good hands, will remain in decorative condition for years.

For this reason they have come to be recognised as ladies' favourites, and some ladies who take an interest in their ferns, and study their requirements, do manage them well.

Generally speaking, if they get the same conditions as they grow in naturally, they will succeed, but as these conditions can be obtained only with difficulty, others have to be resorted to.

Many of our kinds are common wherever there are true forest conditions, *i.e.*, a cool, moist atmosphere, damp ground, shelter, and a heavy shading with trees.

Such conditions are most easily maintained under a glass, or canvas roof, and plants grown in such places thrive luxuriantly, but are tender, and require constant watching ; for an hour's exposure to a hot, dry wind, through the door being accidentally left open, will sometimes destroy six months' growth. These same kinds, if grown under a verandah and kept out of the sun's direct rays, will grow equally well, though not so strongly, and will stand much more variation of temperature and humidity.

Humidity is, however, the first element in fern culture, and, where a certain amount of moisture in the atmosphere cannot always be maintained, it is almost useless to attempt to grow these forest ferns. Some kinds like a good deal of heat ; but generally the south side of a building is a better place than the north.

Erect a break-wind at each end of the fern bed or shelf, and, if convenient, have it under a rain-proof cover, such as an iron verandah, for nothing does them more damage than to be exposed

to a week's heavy rain without perfect drainage. They may be well grown under the shade of trees, or under a vine trellis, but in such positions they seldom obtain sufficient shelter from wind. If planted in a bed it should be deeply dug before planting, and, if possible, given some drainage, for it must be remembered that, though many ferns grow naturally along the forest streams, and in places where their roots are always either in, or near, the water, still they will only grow if the water is always running, or at least moving, and to plant them in stagnant water is to arrange their certain death. For soil they are not very particular. Leaf-mould is of course best, but in the absence of that, good loam, loam and sand, loam and well rotted tan refuse, or well rotted stable litter, brick dust, or almost any other soil which does not contain clay, iron-gravel, or kraal manure will do. For pot culture, earthenware pans, or pots, where procurable are best, but tins answer the purpose equally well if properly drained. This drainage is managed by driving several holes through the bottom of the tin, above this place a layer two inches deep of broken bricks, then a thin layer of moss, or fallen tree leaves, and above that the soil. In English nurseries broken flower pots are used for covering the holes, and they are certainly the best thing, but here they are too expensive, and bricks answer nearly as well.

The soil should be as described above, and perhaps the best test of its suitability is that it can dry again quickly after rain, for it is easy to give more water, but most difficult to make a saturated plant dry. The tin or pot should be about the size of the root, but not much larger, or the soil will get sour before the plant can utilise it. The best sign of perfect health is an abundant crop of young growing roots pushing their way through among the broken bricks at the bottom, and this may also be taken as notice that the plant wants a larger tin.

Be careful in watering to give only when required, which may be twice a-day with one plant, and once in two weeks with another standing beside it. Knowing when they are dry comes only by practice; but it is seldom that a fern lover, who does not know this, can keep his ferns long in good health.

Watering must, however, be understood as quite a different thing from syringing, or otherwise damping the foliage, which may be done lightly two or three times a day all over with benefit. Almost all the ferns described hereafter as being found in the forest can be subjected to the above treatment, but a few grow only in the dampest, and most constantly moist spots, and to get these to do well the moist condition is an absolute necessity, and can best be provided by growing them in a shady corner under a close bell-glass, or in a glass case, and well do they repay the extra trouble. Among these are the filmy ferns, and *Gymnogramme lanceolata*, *Polypodium sinuatum*, and *Vittaria lineata*. *Hemitelia* comes naturally within this group, and hence the difficulty generally experienced in growing it. To succeed with it the best method is to begin with quite a young plant, and keep it always healthy and accustomed to your conditions, but, if brought in from the forest when full grown, the probability is that it will keep alive for one season only, or as long as the original sap remains in it, and then die down and never make another start. It never does well in the open air here, the air being too dry; and it is never seen so pretty or luxuriant in cultivation as in the wild state.

Another group of ferns grow above the forest; and most of them, requiring alternate shower and sunshine, are easily cultivated, but a few are most obstinate. The *Gleichenias* especially are difficult to start, and have long been so regarded in England, and this applies to some other ferns with long wiry rhizomes, such as *Pteris aquilina*, and *Polypodium incanum*. The royal road to success in this case is to obtain young seedling plants which are easily managed.

Quite a different class of ferns are those which grow only on rocks, and generally away from the forest; but here, again, the habitat gives a clue to cultivation. They are seldom found on the Kranzes, or other perpendicular rocks, but grow on the nearly flat, bare, exposed tops of huge rock masses, or among the dust gathered under any loose stones lying on this. They seldom get rain, and when they do, the rock absorbs all directly, and the wind

has the soil mellow again in an hour. The rock, however, though it absorbs the rain quickly, retains it for a long time, and parts with it very gradually to the small patches of soil lying above, so, though only 1 to 2 inches deep, they seldom get dust-dry.

Following this, they require in cultivation very abundant drainage, much more than the other kinds, but of such a nature that they can always depend on having the moisture at hand, and never altogether wanting. An 8-inch pot containing 5 inches broken brick, and 2 inches porous soil, placed in a flat saucer containing an inch of water meets their case well, as enough is drawn up by capillary attraction to keep them damp, while none has to be poured into the soil. This group includes *Nothochlæna Eckloniana*, *Cheilanthes hirta*, var. *intermedia*, and *C. parviloba*, *C. pteroides*, *Pellæa hastata*, var. *glauca*, *Gymnogramme cordata*, *Pellæa calomelanos*, *Asplenium Adiantum-nigrum*, *Pellæa auriculata*, and all the Karroo and Namaqualand species.

CYATHEA is peculiar, in that it grows on high, bare, exposed hillsides, where the fronds gather in any dew or rain that falls, and distribute it about the crown where it is retained among the mass of scales. Its huge stems store up enough vitality to keep them alive for a year after removal to a lower level, but if large they seldom last more than that. If taken young they grow all right, and only require patience to develop healthy stems.

SCHIZÆA grows almost in water, and OPHIOGLOSSUM in dry grassy slopes, but neither have much horticultural merit.

A fern rockery behind a wall, and with an overhanging tree, suits most ferns well, as the wall and tree break the wind and sun's rays, while the stones draw up moisture. The rock growing kinds can get the most sunny spots on this, and with all the others their natural requirements should be studied when they are being planted. Artistic arrangement, and the use of a suitable background of stones, or *Hymenophyllum*, add immensely to the effect, as may be seen on visiting such splendid Fern Grottos as those of L. Marquardt, Esq., Cape Town, or John Wood, Esq., Grahamstown.

When selecting ferns for planting—whether in the forest, on the rock, or in the nursery, do not select the fine big plants with abundant foliage, as the season's growth is past before they have obtained this, and the chances are that you will not manage to take this tender foliage home intact, and keep it up. Select, in early spring, rather small plants, with only enough foliage to shew what they are, and then, when planted, cut off even that little, and the result will be that in a few weeks the young growth will start fresh and beautiful, and hardy enough to stand the summer under the changed circumstances.

Another advice often required by fern-hunters in the forest is to gather no more than they can carefully handle, and either cut off all the foliage in the forest before they wither off by evaporation, or else puddle the roots into a tin basin, and shade the tops with a few upright sticks surrounded by a large piece of hard paper. A few, carefully moved in this way, give more satisfaction than a wagon-load that have been unprotected for two or three days.

IDENTIFICATION AND PRESERVATION.

THE student desirous of making himself acquainted with the classification of ferns must begin by thoroughly mastering the chapter on the parts of ferns, and the terms used in describing them. Having done so, the next thing is to definitely understand the differences between the seven sub-orders; and in connection with this, it is much to be regretted that no other good character than the opening of the capsule is obtainable. To follow out this character is difficult enough to bring many young students to a stand-still, but with us, fortunately, there are only a few species each in sub-orders I., II., IV., V., VI., VII., leaving the vast majority in Sub-order III. Besides this, these few species from Sub-orders I., II., IV., V., VI., VII. are, with the exception of *Mohria*, so distinct in their general appearance that with them the figures are sufficient for identification, and, when once known, he who wishes to study up the capsules can easily do so.

In Sub-order III. the species are numerous, and often closely related to one another, but the characters of the genera are easily followed.

When examining a plant, always make sure of the genus first, then compare it with the distinctive characters of each species in that genus, the point most to be noticed being given in the synopsis at the beginning of each genus.

To go by the illustrations without consulting the text is very superficial work, and to attempt to follow descriptions, without first having mastered the alphabet, as the technical terms have been called, can only end in disgust.

A little practice only is required to enable anyone to follow out the distinctions and connections between the different groups, and then the ferns will be found to form one of the most beautiful, interesting, and easily understood orders of our South African Flora.

Besides cultivating ferns, a most interesting method of preserving them is, as dried specimens, in the form of a herbarium.

For this purpose perfect plants, nearly mature, should be selected, and placed at once between sheets of paper—sufficient paper being used to absorb all the moisture in the plant. With the larger kinds one frond only can be kept instead of a whole plant, but any peculiarity such as a running rhizome, a scaly crown, or a tree stem, should if possible be shown or noted.

The paper may require to be changed several times before the specimen is dry, and a pressure sufficient to keep the frond flattened is required all along. When dry, the specimen should be mounted on uniform sheets of stiff paper, or in a book, fixed by strips of gummed paper, or by threads sewed through, and furnished with a label stating the name of the fern, where and when found, kind of locality, and any other particulars of interest. Many botanists fix their specimens to the paper with gum, and in whichever manner they are fixed, they ought to be poisoned to keep away insects.

Such a collection is easily formed, and when once in order remains for many years—to its maker an object of interest ; to his friend a proof of his perseverance ; and not unfrequently to both a reminder of happy holidays spent in one another's company long ago.

THE FERNS OF SOUTH AFRICA.

THE number of species of ferns in South Africa is remarkably small compared with the whole flora, and in the south-west portion, this is especially the case, and it is probably on this account that, while fifty years ago, Cape heaths, geraniums, and bulbs, were the leading favourites in English Conservatories, Cape ferns were almost unknown.

They had indeed, like other plants, been collected by the earlier travellers, among whom were Burmann, de Chamisso, Sparrman, P. J. Bergins, Krebs, and Lichtenstein, and a few species had been described by Bergins, Linnæus, and Willdenow, before the beginning of the present century, but it remained for Thunberg to describe the South African ferns as a group, for the first time, in his "Prodromus Plantarum Capensium" (1800).

It is interesting to compare the species then known, and the names in use in those days, with present ideas on the same subject, and for this purpose his list of ferns is given, and opposite to each species the present name for the same plant.

THUNBERG'S NAME.	PRESENT NAME.
Onoclea capensis . . .	Lomaria procera.
Ophioglossum lusitanicum .	Ophioglossum vulgatum.
Osmunda barbara . . .	Todea barbara.
Acrostichum cordatum . .	Gymnogramme cordata.
Pteris cuspidata . . .	Marattia (young).
Pteris tabularis . . .	Lomaria Boryana.
Pteris cretica . . .	Pteris cretica.
Pteris confluens . . .	Pellæa auriculata.
Pteris incisa . . .	Pteris incisa.
Pteris auriculata . . .	Pellæa hastata.

THUNBERG'S NAME.	PRESENT NAME.
<i>Pteris capensis</i> . . .	<i>Pteris aquilina</i> .
<i>Pteris flabellulata</i> . . .	<i>Pteris flabellata</i> .
<i>Pteris hastata</i> . . .	<i>Pellæa calomelanos</i> .
<i>Schizœa pectinata</i> . . .	<i>Schizæa pectinata</i> .
<i>Blechnum australe</i> . . .	<i>Blechnum australe</i> .
<i>Cœnopteris rutæfolium</i> . . .	<i>Pteris rutæfolia</i> .
<i>Asplenium falcatum</i> . . .	<i>Asplenium erectum</i> .
<i>Asplenium furcatum</i> . . .	<i>Asplenium furcatum</i> .
<i>Polypodium ensiforme</i> . . .	<i>Polypodium ensiforme</i> .
<i>Polypodium tottum</i> . . .	<i>Gymnogramme totta</i> .
<i>Polypodium aculeatum</i> . . .	<i>Polystichum aculeatum</i> .
<i>Polypodium capense</i> . . .	<i>Hemitelia capensis</i> .
<i>Adiantum auriculatum</i> . . .	<i>Pellæa auriculata</i> .
<i>Adiantum capense</i> . . .	<i>Cheilanthes capensis</i> .
<i>Adiantum caffrorum</i> . . .	<i>Mohria caffrorum</i> .
<i>Adiantum pteroides</i> . . .	<i>Cheilanthes pteroides</i> .
<i>Adiantum Œthiopicum</i> . . .	<i>Adiantum œthiopicum</i> .
<i>Gleichenia polypodoides</i> . . .	<i>Gleichenia polypodoides</i> .
<i>Hymenophyllum Tunbridgense</i>	<i>Hymenophyllum Tunbridgense</i> .
<i>Trichomanes incisum</i> . . .	Abnormal pinnæ on <i>Hemitelia</i> .

It will be seen from this, that the limits of the genera have undergone considerable alterations since that time, and also, that several specific names have been changed. It will also be noticed, that every species mentioned is to be found near Cape Town, or, at least, between that and Knysna.

About the same date, Swartz was at work on the ferns, and in Schrader's "Journal für die Botanik," 1800, 1803, he introduced, among others, a good few South African species.

Soon afterwards Breutel, Mund and Maire, Burchell, C. W. Bergins, and Rev. Mr. Thom, were all collecting, while Rev. Mr. Hesse of Cape Town sent to Europe a collection of ferns and Lycopods, which were described in Schrader's "Göttinger Gelehrte Anzeigen," 1818.

Thunberg's "*Flora Capensis*," 1823, contains only the same ferns as his previous "*Prodromus*," but in 1825, Prof. de Schlechtendal began to issue his "*Adumbrationes Plantarum*," the first volume of which was on Cape ferns, and, though unfinished, it is the most important work ever issued on South African ferns. In its unfinished state it contains excellent figures of 30 species, and descriptions of 70 species of ferns and fern allies, almost all good species, still maintained, though in some cases under different names.

1823 saw the arrival of C. F. Ecklon, and K. L. P. Zeyher, while in 1826, J. F. Drège arrived. All three collected plants for sale, and from their collections, the whole flora of South Africa as far as Natal and Transvaal may be said to have been made known, while, at the same time, Burke travelled in the Transvaal, and Gueinzus made a most complete collection of the ferns of Natal.

Prof. Presl's "*Tentamen Pteridographiæ*" (1836), brought the knowledge of ferns generally, well up to date, and Kunze, in the same year reviewed the ferns of South Africa in "*Linnæa*,"* after having examined the collections of all these more recent collectors.

He made out 33 genera, and 111 species, many of which were new, but have since been sunk as varieties only. Subsequent numbers of "*Linnæa*" contain Kunze's further investigations, especially 1844, and some African species are figured by Kunze in "*Die Farnkräuter in Colorirten Abbildungen*" (Leipzig, 1840).

Harvey in his "*Genera of South African Plants*," 1838, describes 31 genera, but does not definitely indicate the number of species.

Sir Wm. Hooker's "*Genera Filicum*" (1838), and his "*Species Filicum*" (1846-64), considerably altered the nomenclature, but were not followed by Pappe and Rawson, whose "*Synopsis Filicum Africæ Australis*," 1858, is the latest work in which descriptions are given of all the South African ferns then known, as a united group. Kunze's nomenclature and descriptions are very closely followed, and, though many new species were described, only a few of them have been upheld by the more recent

* *Plantarum acotyledonearum Africæ Australioris recensio nova*, I Filices, *Linnæa*, 1836.

authorities on ferns, the great majority having sunk into the position of varieties. Altogether, 161 ferns and fern allies are described, besides 16 species described by former authors, on which Pappe and Rawson had doubts.

Lowe's "Ferns, British and Exotic," (1860), and Hooker's "Filices Exoticæ," (1859), include descriptions and figures of a few South African species.

Mettenius' "Re-arrangement of Ferns" (ueber einige Farn-gattungen, 1851-9), is followed by Kuhn, whose "Filices Africanæ" (1868) gives a complete list of the ferns and fern allies of Africa and the African islands, with descriptions of new species, and the most complete and accurate synonymy, that materials would allow.

In this remarkable book, 59 genera, and 683 species (including fern allies), are credited to Africa. So far as South Africa is represented in it, the materials were drawn, in good part, from Pappe and Rawson's synopsis, with the result that a few species, which had evidently not been compared, are maintained, which do not deserve to be so.

Moore's "Index," about the same date, gives splendid illustrations of the generic distinctions, and also most complete synonymy so far as it goes, but it was never completed, and only goes on alphabetically to G.

Hooker and Baker's "Synopsis Filicum" (1868), again brought fern knowledge up to date, and put the systematic work in such form, that the identification became more easy, and consequently the study became more popular. This splendid work contains descriptions of 2235 species.

In Harvey's "Genera of South African Plants," 2nd edition (1868), the genera of Cape ferns are set down by Mr. Baker at 37, and the species at 132.

McKen, immediately after the issue of Hooker and Baker's "Synopsis Filicum," prepared a small "Ferns of Natal" (1869), in which the descriptions of genera and species are transcribed verbatim from the synopsis, but with the addition of a good many Natal localities. He gives 120 species, but included several which were mistakes.

Up to, and about, this date, the principal collectors, not already mentioned were, in Cape Colony, Dr. Pappe, Hon. R. W. Rawson, Dr. Harvey, Dr. Alexander, Sir Henry and Lady Barkly, Dr. Atherstone, Capt. Espinasse, Col. Blagrove, Mrs. Barber, Mrs. Kitton, Mrs. Holland, Dr. Shaw, Rev. Mr. Baur, and Messrs. McGibbon, Forbes, and Browning; and in Natal, Dr. Krauss, Dr. Cattell, Rev. J. Buchanan, and Messrs. Plant, W. T. Gerrard, and M. J. McKen; while Messrs. Ayres, J. Sanderson, J. Todd, and F. Oates, collected in Natal and the Transvaal.

The issue of the 2nd edition of Hooker and Baker's "Synopsis Filicum" (1874), gave a renewed interest to Pteridology, and in the Cape, a further impetus was bestowed, by the attention given to it by His Excellency the Governor Sir Henry Barkly, and by Lady Barkly, who in 1875 prepared a revised list of South African ferns, giving localities, or distribution, so far as given in the "Synopsis Filicum," or shown by specimens in the Cape Government Herbarium, along with the results of their own travels, and with Natal notes supplied by Rev. J. Buchanan.

In this list, so great a number of Pappe and Rawson's species are merged into others, that, including additions made in the meantime, the total number of species is reduced to 153.

Corresponding with this, and in the same year, came Rev. J. Buchanan's revised list of Natal ferns, in the "Natal Colonist," with numerous notes upon the rarer, or more confused species—a most useful list, in which 132 ferns, and 13 fern allies, are enumerated, and Natal localities given. In 1877, Wood's "Ferns of Natal" was issued, in which good popular descriptions are given of 119 species, along with distribution, Natal localities, &c.

In Hooker's "Icones Plantarum," 1886, three parts are devoted to the new ferns, and include several South African species (with figures).

Oates' "Matebeleland" (1881), describing a journey from Durban to the Victoria Falls on the Zambesi, includes a list by Baker, of plants collected, numbering 67 species, of which 10 are ferns; and one new species, *Adiantum Oatesii*, Bkr, is described and figured. Only four of his species are included by me in the

present work, as his collections seem to have been made mostly near the Zambesi, and therefore beyond my district; but this small list indicates that the fern flora changes considerably beyond the tropic. The ten species are, *Pellæa consobrina*, Hk., *Adiantum æthiopicum*, L., *A. Oatesii* Bkr., *A. lunulatum*, Burm., *Cheilanthes farinosa* Klf., *Nephrodium molle* Desv., *Nephrodium* (*Lastrea*) sp, *Nephrolepis exaltata* Schott., *N. cordifolia* Pr., *Mohria caffrorum* Desv.

Dr. Hans Schinz' "Observations on collection of Transvaal Plants, collected mostly near Elim," includes only two species, *Nephrodium Bergianum*, and *Cheilanthes hirta*, Sw., but that is evidently not representative of the Transvaal mountain forests, as we have Transvaal localities for 61 species, and Buchanan mentions a collection of 68 species sent down by Mr. Ayres.

My own "Handbook of Kaffrarian Ferns" (1891) is the latest work dealing exclusively with the ferns of any part of South Africa, and 68 ferns, and 7 fern allies, are therein enumerated as belonging to Kaffraria, but it may be explained that Kaffraria, as understood in that work, was restricted to what was formerly the Colony of Kaffraria; while the Kaffrarian district, as understood in the present work, includes all the Transkeian territories, and has as many as 89 species of ferns.

Among more recent collectors not already mentioned, and most of whom are still alive, may be included:—Prof. MacOwan, B.A., F.L.S., Dr. Marloth, F.L.S., Dr. Schönland, F.L.S., Mrs. Young, Messrs. H. Bolus, F.L.S., H. Flanagan, W. Tyson, W. C. Scully, B. H. Holland, F. H. Ely, Roth, J. Leighton, Guthrie, and Gordon, in Cape Colony; and in Natal, Mr. J. M. Wood, A.L.S., and Dr. Rehmann; while in the Transvaal, Messrs. H. Bolus, J. Fry, J. H. McLea, Dr. Rehmann, and others, have made considerable additions to the collections already mentioned.

The vast extent of country from Kimberley to the Atlantic Coast, along the Orange River, and north of it, does not appear to have been examined for ferns except by Burchell; and Namaqualand, only by hurried visits of Sir H. Barkly, and Mr. Bolus, and by Mr. Scully.

New species have been described in various journals, including, "Journal of Botany" (July, 1874), and "Gardener's Chronicle" (Nov. 16th, 1889), and now, all additions to, or alterations on, the 2nd edition of Hooker and Baker's "Synopsis Filicum," have been brought together by Mrs. Baker in "Annals of Botany" (1891).

The South African fern allies are included in most of the South African books already mentioned, and were described, along with those from other parts of the world, by Spring, in Vols. 15 and 24 of "Memoirs de l'Academie royale de Belgique" (1842 and 1849), and again carefully monographed by Mr. Baker in his "Handbook of Fern Allies (1887), in which 562 species are described, separated into 11 genera, and 5 orders. Of these, only 22 species are known to be South African, and 10 are found nowhere else.

In the preparation of the following pages, almost all the above works have been consulted, and collated with live plants, or with dried specimens. The collection in the Cape Government Herbarium is almost complete, including many collected by Ecklon and Zeyher, Drège, Dr. Pappe, Rawson, and Lady Barkly, as well as numerous additions from most recent collectors.

Mr. Bolus has also a very complete set, and the collections in the Natal Government Herbarium, Albany Herbarium, and my own, as well as several other private herbaria, are almost complete as local collections.

Several large collections of South African plants have been numbered and distributed, most of which contain some ferns.

Among these, Burchell's is about the earliest, and as they were distributed with numbers corresponding to his "Geographical Catalogue," and which have since been arranged in MSS. by Mr. Bolus, the locality for any specimen can still be traced.

Drège's collections were also distributed, as were the collections of Ecklon and Zeyher, which had the localities numbered corresponding with a list of localities in "Linnæa," vol. 19.

The collections of Krauss, and Dr. Rehmann (1875-1880), were distributed with localities on the labels, as also have been the

few ferns as yet sent out in "Herbarium Normale Austro-Africanum," by Messrs. MacOwan and Bolus.

It may surprise some that, after a lapse of 17 years since Lady Barkly's list was published, the total number of ferns should now be only 157, as compared with 153 then, but it must be remembered, that the cutting down process has again been in action, and that some forms, which were then considered species, have had to be reduced on further acquaintance to varieties ; while not a few have been put off the list as being considered mistakes, either in nomenclature, or as to country.

From these causes, no fewer than 14 of Lady Barkly's species have been excluded from the present work, as under, the reason why being explained where they are mentioned further on.

Species reduced to varieties, or excluded as mistakes :

Trichomanes filicula, Bory.	Asplenium brachypterum, Kze.
— digitatum, Br.	— Ceterach, L.
Pellæa andromedæfolia, Fée.	— aculeatum, Sw.
Pteris tremula, Br.	Nephrodium conterminum, Desv.
Asplenium dimidiatum, Sw.	— spinulosum, Desv.
— splendens, Kze.	Polypodium obtusilobum, Desv.
— bulbiferum, For.	— Schraderi, Mett.

The 18 new species, or species again raised to species rank, are as under :—

Trichomanes muscoides, Sw.	Aspidium luctuosum, Kze.
Adiantum reniforme, L.	— Macleani, Bkr.
— paradisise, Bkr.	Nephrodium Mauritanum, Bkr.
— thalictroides, W.	— crenatum, W.
Cheilanthes depauperata, Bkr.	— cicutarium, Bkr.
— parviloba, Sw.	Gymnogramme ochracea, Pr.
— Bolusii, Bkr.	Acrostichum latifolium, Sw.
Blechnum remotum, Pr.	— viscosum, Sw.
Asplenium Schimperii, Br.	Aneimia tomentosa, Sw.

In comparison with Buchanan's Natal List, the present enumeration shows less change, and what change there is, depends more on different ideas of what constitutes a species, than on any very distinct new plants having been found. The following are the changes :—

DISCARDED.	NEW, OR RAISED TO SPECIES RANK.
Pteris tremula, R. Br.	Trichomanes muscoides, Sw.
Blechnum Atherstoni, P. & R.	Cheilanthes parviloba, Sw.
Asplenium lunulatum, Sw.	Asplenium gueinzianum, Mett.
— brachyotus, Kze.	— solidum, Kze.
— gracile, P. & R.	— flaccidum, Forst.
— splendens, Kze.	Nephrodium Mauritanum, Bkr.
Aspidium aculeatum, Sw.	Aneimia tomentosa, Sw.
Polypodium obtusilobum, Desv.	
— Schraderi, Mett.	

Buchanan credited 132 species of ferns to Natal, and the above changes make the number now 130.

The following species are mentioned, but not enumerated, which were credited to South Africa in Hooker and Baker's "Synopsis Filicum," the reason of the omission being explained under each species :—

- Trichomanes digitatum, Sw.
- filicula, Bory.
- Pellæa andromedæfolia. Fée.
- Pteris serrulata, L.
- marginata, Bory.
- tremula, R. Br.
- Asplenium brachypterum, Kze.
- Ceterach, L.
- bulbiferum, Forst.

Aspidium aculeatum, Sw. (as distinct from *A. pungens*, Klf.)

Nephrodium spinulosum, Desv.

Polypodium obtusilobum, Desv.

— *Schraderi*, Mett.

— *Mackenii*, Bkr.

DISTRIBUTION.

THE area examined in this work is nominally that part of Continental Africa lying south of the tropic of Capricorn. It is needless, however, to state that nearly half of this vast area is still almost a *terra incognita*—even as regards its physical features, and much more so as regards its botany. It would be most misleading to say that the species which have been recorded from the Orange Free State, Transvaal, Kalihari, Matebeleland, and Mashonaland, are all that exist in them, or even in any way representative of what does exist in them; and the records from these parts are merely given here as a quota towards the much fuller knowledge of these districts which another decade will likely give us. A more correct definition of the area which has been in any measure satisfactorily examined would restrict it to a belt of country, less than 100 miles wide, stretching all round the coast from the mouth of the Orange River to the northern border of Natal—1500 miles or thereby. To this might be added the Karoo region, which is known to have only a very limited number of species of ferns, and some of these peculiar to it.

The total absence of information on the ferns of the coast, both on the west side, north of the Orange River, and on the east side, north of Natal, is very much to be regretted, as many other species are known from both coasts further along; and the same may be said of the central region in Mashonaland and Matebeleland, drained by the Zambesi, which, as already mentioned, was shown by Oates to have a different fern flora at a short distance further north. Madagascar has been entirely excluded, though in part subtropical.

In endeavouring to divide South Africa into smaller botanical areas, each having its own peculiar flora, the physical features require to be taken notice of, and, for plants in general, Mr. Bolus

has done this in a most satisfactory manner.* The leading idea in his arrangement is, that from the east coast to the Drakensberg and Stormberg mountains, the tropical flora extends south, till cut off by the Karroo ; which, crossing from the Atlantic to the Indian ocean, has a flora peculiar to itself, and that the mountains and slopes south of the Karroo have quite a distinct flora. The upper Karroo forms his composite region, and his Kalihari region includes the remainder.

The distribution of ferns, apart from cosmopolitan species, will most probably be found to follow in a general way the same lines, though the presence or absence, of almost half of our ferns, seems to be controlled more by the humidity of the atmosphere in any given spot, than by its geographical position, and it has been found more convenient here to adopt well known geographical areas, as under, but in which the main idea of Mr. Bolus' arrangement is maintained.

1. West, or south-west, including :—
 - a. The coast slopes from the mouth of the Olifant's River on the west coast, to the mouth of the Groote River on the east coast.
 - b. The Karroo, Upper Karroo, and Namaqualand.
2. East, from the Groote River to the Fish River, and up to the Winterberg and Sneemberg Mountains.
3. Kaffraria, from the Fish River to the Natal Border.
4. Natal.
5. Orange Free State.
6. Transvaal.
7. Bechuanaland.

The east district is, in part Karroo, modified as it approaches the coast, and the west and east districts together, comprise the Karroo and all south of it, while the others form natural divisions of the district north of the Karroo.

The following list shows how the ferns are distributed through these, and it also shows what species grow in South Africa and no-

* *Sketch of the Flora of South Africa*, Cape Town, 1886.

where else (marked *), and what species grow also in other parts of Africa, or the African Islands, including Madagascar and the Mascarenes, but are not known to occur in any other part of the world (marked **), also in the case of species growing in other countries, it shows what Continents they inhabit.

		Europe.	Africa.	Asia.	Australia.	Polynesia.	S. America.	N. America.
Karoo and South of it.	West only—							
	Hymenophyllum obtusum			+				
	** pteroides (recorded also once from Natal)							
	* Cheilanthes depauperata							
	* auriculata (recorded also once from Natal)							
	* Pellaea deltoidea							
	* robusta							
	* lancifolia							
	* namaquensis							
	* Asplenium Rawsoni (only once found)							
	* Nothochlæna Rawsoni („)							
	Gymnogramme leptophylla	+	+	+	+		+	
	** Monogramme graminea (only once found)							
	Acrostichum conforme		+	+	+		+	
	* Ophioglossum Bergianum							
	East only—							
	* Adiantum Paradisiæ							
	* Cheilanthes Bolusii							
	West and East only—							
	* Cheilanthes induta							
Kaffraria only—								
	Blechnum remotum						+	
Kaffraria and Natal only—								
	** Davallia nitidula							
	* Lomaria inflexa							
	** Asplenium Dregeanum							
	..... Aspidioides		+	+			+	
	** Nephrodium elatum							
	** Polypodium Africanum							
	..... irioides			+	+			
	Acrostichum hybridum		+				+	
	** tenuifolium							
	* Aneimia Dregeana							
Natal only—								
	Gleichenia dichotoma		+	+	+		+	
	Trichomanes muscoides			+		+	+	
	..... pusillum						+	+
	Lindsaya ensifolia		+	+	+			
	** Adiantum reniforme							
	** Asplenium Sandersoni							
	* Gueinzianum							
	..... serra. var.	+					+	

We have thus set out 17 species which grow only in the Karroo district, or south of it, and 64 species which are not recorded south of it. Besides these, 12 northern species extend into the eastern district, but not to the west, viz. :—

	Europe.	Africa.	Asia.	Australia.	Polynesia.	S. America.	N. America.
<i>Cystopteris fragilis</i>	+	+	+	+		+	+
<i>Pellæa geraniifolia</i>		+	+	+	+	+	
<i>Pteris longifolia</i>	+	+	+	+		+	+
* <i>Asplenium Kraussii</i>							
..... <i>ebeneum</i>						+	+
..... <i>varians</i>			+				
..... <i>anisophyllum</i>						+	
** <i>prionitis</i>							
..... <i>cuneatum</i>		+	+		+	+	
* <i>Aspidium luctuosum</i>							
..... <i>falcatum</i>		+	+				
<i>Acrostichum aureum</i>		+	+	+	+	+	+

The remaining 64 species, as under, are to be found more or less throughout the whole seaboard area, though the absence of *Pteris incisa*, and *Todea barbara*, and also almost, of *Lomaria punctulata*, and *Osmunda regalis*, from Kaffraria, while they occur on both sides, is very noticeable, and the occurrence of *Cheilanthes pteroides* and *Pellæa auriculata* in Natal also seems peculiar :—

	Europe.	Africa.	Asia.	Australia.	Polynesia.	S. America.	N. America.
** <i>Gleichenia polypodoides</i>							
<i>Hemitelia capensis</i>		+			+	+	
<i>Hymenophyllum rarum</i>		+		+			
..... <i>Tunbridgense</i>	+	+		+		+	
..... <i>pyxidiferum</i>		+	+			+	+
<i>Davallia concinna</i>		+	+			+	
<i>Adiantum Capillus-Veneris</i>	+	+	+	+		+	+
..... <i>thalictroides</i>		+	+			+	+
..... <i>(Ethiopicum)</i>		+		+			
<i>Lonchitis pubescens</i>		+					
** <i>Hypolepis anthriscifolia</i>							
** <i>Bergiana</i>							
* <i>Cheilanthes capensis</i>							
** <i>hirta</i>							

	Europe.	Africa.	Asia.	Australia.	Polynesia.	S. America.	N. America.
* Cheilanthes parviloba							
..... multifida		+			+		
** Pellaea consobrina							
** involuta							
** hastata							
..... calomelanos		+	+				
Pteris cretica	+	+	+		+	+	+
* flabellata							
* Buchanani							
..... incisa		+	+	+		+	
..... aquilina	+	+	+	+		+	+
Lomaria attenuata		+		+	+		
..... punctulata						+	
..... procera				+	+	+	+
..... Boryana		+				+	
Blechnum australe		+	+			+	
Asplenium Trichomanes	+	+	+	+		+	+
..... monanthemum		+				+	+
..... erectum		+	+	+		+	+
** protensum							
** gemmiferum							
..... Adiantum-nigrum	+	+	+				+
* solidum							
..... furcatum		+	+	+		+	+
..... rutæfolium		+	+				
* Aspidium aculeatum, var. pungens							
..... capense		+		+	+	+	
* Nephrodium Bergianum							
..... unitum		+	+	+	+	+	+
..... Thelypteris	+	+	+	NZ ^x			+
..... Filix mas, var. elongatum	+	+	+				+
** inæquale							
** catopteron							
Polypodium vulgare	+	+	+				+
..... incanum		+				+	+
* ensiforme							
..... lineare		+	+				
..... lanceolatum		+	+			+	
* Nothochlæna Ecklonianum							
Gymnogramme totta		+	+				
** cordata							
Vittaria lineata		+	+			+	+
Acrostichum viscosum		+	+			+	
Osmunda regalis	+	+	+			+	+
Todea barbara		+		+			
* Schizæa tenella							
** pectinata							
** Mohria caffrorum							
Marattia fraxinea		+	+	+			
Ophioglossum vulgatum	+	+	+	+			+

* New Zealand.

SUMMARY OF FOREGOING LIST.

DISTRICTS.	Other Countries in which the same Species are found.									
	Africa.	Europe.	Asia,	Australia.	South America.	North America.	Polynesia.	Confined in S. Africa to this district but found in other Countries.	Confined in S. Africa to this district, though found in other parts of Africa, but nowhere else.	Growing in no other part of the World.
Total number of Species recorded.	75	14	9	2	3	3	2	2	2	9
West, East, West and East, Kaffaria, Kaffaria and Natal, Natal, Natal and Transvaal, Transvaal, Kaffaria, Natal, and East, Whole area of South Africa,	75	14	9	2	3	3	2	2	2	9
	78	2	2	...	...	...	...	...	...	2
	89	1	1	...	...	...	...	...	...	1
	10	1	...	...	...	...	...	...	...	...
	130	25	3	6	5	3	4	4	4	3
	8	2	...	4	4	4	1	1	1	1
	61	10	1	7	8	4	3	3	3	3
	...	10	3	2	...	...	...	...	...	...
	12	10	2	...	...	...	...	...	...	...
	64	9	9	15	40	9	3	3	3	3
Fern Allies,	157	32	38	73	14	60	34	56	28	26
	22	10	2	10	2	25	16	25	19	38
	179	42	40	97	73	14	60	34	56	28

It is noticeable that, of the 179 South African species only 42 are endemic, and only 82 confined to Africa and its islands. To show how this compares with the proportions for the whole of Africa, as well as for some of the African islands, the following is

quoted from Kuhn's "*Filices Africanæ*," and the numbers for Australia from Baron Mueller's 2nd Census, the percentages being added :—

	Species.	Endemic.	Proportion per 100.
Africa, including Islands,	683	458	67
Madeira,	51	4	8
Canaries	43	1	2 $\frac{1}{3}$
Caboverdias,	32	1	3
Ascension,	12	5	41
St. Helena,	30	10	33
Tristan d'Acunha,	30	7	23 $\frac{1}{3}$
Fernando Po,	84	12	14 $\frac{1}{2}$
Principii,	18	2	11
St. Thomas,	18	1	5 $\frac{1}{2}$
Mauritius	192	48	25
Bourbon,	220	96	43 $\frac{1}{2}$
Madagascar,	144	37	25 $\frac{1}{2}$
Nossi-beh,	26	3	11 $\frac{1}{2}$
Comoras,	75	5	6 $\frac{2}{3}$
Seychelles,	30	6	20
Australia,	244	62	25 $\frac{1}{2}$
South Africa, as above,	179	42	23 $\frac{1}{2}$

Pappe and Rawson claimed 88 species as endemic out of their total of 161, but so many of their endemic species have since been discarded, that Lady Barkly only allowed 37, and with all recent additions, I find only 42.

There is no genus confined to South Africa, nor is any genus, except *Mohria*, mostly South African, while of the South African endemic species more are confined to the Karroo than to any other one district.

Among those species which occur in other countries, there is nothing to indicate a special connection of the flora of South Africa, or of any district in it, with any other country. This is worthy of note, as other portions of the very peculiar South-Western flora have a considerable connection with that of Australia, and Kuhn remarks on such a connection among the ferns, while we find that among the ferns confined in South Africa to the South-West district, only two widely distributed species occur in Australia.

From the 75 South-Western ferns, only 18 are found in

Australia, and these, with one or two exceptions, are cosmopolitan; while 28 occur in Asia, 28 in South America, and 19 in North America. More decided is the connection of the Natal ferns with those of India.

Of the 130 Natal species, 52 occur in Asia, and at least 40 of this number in India, 27 of which do not extend south of Port Elizabeth, and many not south of Natal.

The absence of European forms may be noted, only 14 being found, all cosmopolitan in similar climates, and all, except *Pteris cretica* and *P. longifolia*, found in England.

The number of species found in South Africa is small compared with India, or Brazil, or the tropical islands, but is quite as large as in similar large areas outside the tropics. To the whole of Europe Kuhn credits 123 species; in the whole of Australia Baron Mueller finds 244 species; while Dr. Asa Gray allowed only 90 species for the Northern United States of America, of which 33 are fern allies.

If the Karroo be excluded, the number of species to be found in any part of South Africa of equal size with Great Britain is about double the number found there.

The total number of ferns and fern allies for the whole world is about 3500 species, so only about $4\frac{1}{2}$ per cent. of the whole number are as yet known to be South African.

Compared with the whole flora of South Africa, the ferns are remarkably few, for as it is estimated that there are 10,000 species of flowering plants within our area, ferns form only $1\frac{1}{2}$ per cent., while in Australia, with about 9000 known species of plants, they form $2\frac{2}{3}$ per cent.; and in several sub-tropical islands they form from 20 to 50 per cent. of the whole flora.

Not one of the numerous foreign ferns imported into the Cape for cultivation is as yet known to have thoroughly established itself anywhere in our forests, or even to have attempted escape, except the record of *Pteris tremula* in Natal, which doubtless was such a case. Possibly also the existence of *Pteris longifolia* at Uitenhage may be due to the garden formerly kept up there by Dr. Brehm.

CLASSIFICATION OF FERNS AND FERN ALLIES.

Key to the Orders and Genera.

ORDER I.—FILICES.—FERNS.

Capsules in groups, on the under surface of the frond ; or on differentiated fertile pinnæ ; in the latter case not covered by an indusium. Capsules one celled, all alike in one species, and containing minute uniform spores without filaments.

SUB-ORDER I.—GLEICHENIACEÆ. Capsules few in sorus, large, composed almost entirely of a broad, elastic, jointed, complete ring, which crosses the top, and opens vertically by the separation of two joints of the ring. Fronds dichotomously branched. Sori on the back of the frond. Vernation circinate.

Genus I.—GLEICHENIA. Characters as above.

SUB-ORDER II.—HYMENOPHYLLACEÆ. Capsules roundish, or flattened, surrounded by an obliquely transverse entire ring. Capsules enclosed in a cup, and surrounding an elongated receptacle, which is terminal on the veins, and marginal on the frond. Vernation circinate.

Genus II.—HYMENOPHYLLUM. Involucre a cup of same texture as the frond, and placed on its margin, more or less compressed, and distinctly two-lipped, or cut into two valvès.

Genus III.—TRICHOMANES. Involucre a deep cup, not much compressed, and with an entire mouth, or slightly two-lipped when young.

SUB-ORDER III.—POLYPODIACEÆ. Capsules many in a sorus, small, often stalked, having a jointed elastic band passing up

one side, over the top, and partly down the other side, and opening horizontally at the part where the band is wanting. Sori on the back of frond, veneration circinate.

Division I.—*Involucratae*. Sori furnished with an involucre or indusium. (Genera IV. to XXIV.)

* Involucre cup-like, enclosing the sorus, or scale-like, and placed under it.

Genus IV.—*CYATHEA*. Involucre at first completely enclosing the sorus, afterwards bursting at the top, and remaining as a cup under and around the capsules, which surround a raised receptacle. Stem, tree-like.

Genus V.—*HEMITELIA*. Involucre only a scale placed under the capsules which surround a raised receptacle. Stem, tree-like.

Genus VI.—*WOODSIA*. Involucre at first enclosing the sorus, afterwards bursting at the top into several lobes. Plant small, herbaceous.

** Indusium covering the sorus, and opening toward the margin of the frond.

Genus VII.—*DAVALLIA*. Sori marginal, roundish. Indusium united below and at the sides, only the outer edge being open.

Genus VIII.—*CYSTOPTERIS*. Involucre like a scale attached under the sorus by its wide end, and at first having the other end turned hood-like over the sorus.

Genus IX.—*LINDSAYA*. Sori linear, marginal, covered by a linear indusium, opening outward.

*** Sori Marginal. Indusium composed of the edge of the frond (often changed in texture) reflexed over the sorus, and opening towards the mid-rib.

Genus X.—*ADIANTUM*. Capsules produced on the under-side of the indusium, which varies from kidney-shaped to long, and is produced on the points of the pinnules.

Genus XI.—*LONCHITIS*. Sori in the hollow between two lobes, reniform, or oblong, covered by the indusium. Veins anastomosing.

Genus XII.—*HYPOLEPIS*. Capsules covered by the indusium. Indusium membranous in texture, small, round, equal. Sori in the hollow between two lobes, or on the opposite edge of the frond. Sometimes also scattered along the edge. Veins free.

Genus XIII.—*CHEILANTHES*. Indusium roundish, not continuous, formed of the edge of the frond, which is only partly turned back. Sori abundant—often crowded all round the edge of the frond, except at the sinus.

Genus XIV.—*PELLÆA*. Indusium continuous, or sometimes imperfectly continuous, interrupted or roundish. Capsules produced on the frond under the indusium, in a wide line.

Genus XV.—*PTERIS*. Indusium continuous. Sori in the axil of the indusium, in a narrow line.

Genus XVI.—*LOMARIA*. Indusium continuous. Sori occupying the whole underside of the frond, except the mid-rib. Fertile pinnæ narrower than the barren.

**** Sori not marginal, but covered by a linear or oblong indusium, opening toward the mid-rib.

Genus XVII.—*BLECHNUM*. Sori linear, parallel with the mid-rib.

Genus XVIII.—*ASPENIUM*. Sori linear or oblong, placed obliquely between the mid-rib and the margin.

Genus XIX.—*ACTINIOPTERIS*. Frond flabellate, with narrow segments. Sori submarginal, linear.

***** Sori not marginal, but covered by a reniform or circular peltate indusium.

Genus XX.—*DIDYMOCHLÆNA*. Sori reniform, on the intra marginal raised end of a vein, and covered by a reniform

or elliptical indusium, attached along its length to the vein, and free all round the edges and upper end.

Genus XXI.—*ASPIDIUM*. Sori round, indusium round, fixed by its centre, peltate.

Genus XXII.—*NEPHRODIUM*. Sori kidney-shaped, indusium kidney-shaped, attached by its sinus. Pinnæ not articulated.

Genus XXIII.—*NEPHROLEPIS*. Involucre reniform or sub-orbicular. Pinnæ simple, articulated to the rachis.

Genus XXIV.—*OLEANDRA*. Involucre reniform. Rhizome scandent, fronds simple.

Division II.—*Ex-involucratæ*. Sori without involucre or indusium. (Genera XXV. to XXX.)

Genus XXV.—*POLYPODIUM*. Sori round, or nearly round.

Genus XXVI.—*NOTHOCHLÆNA*. Sori marginal, linear. Fronds two to three pinnate.

Genus XXVII.—*GYMNOGRAMME*. Sori oval, oblong, or linear, not marginal. Frond two to three pinnate.

Genus XXVIII.—*VITTARIA*. Sori in long lines near the margin. Fronds simple, grass-like, with several veins.

Genus XXIX.—*MONOGRAMME*. Sori linear, near the mid-rib. Frond simple, with one vein only.

Genus XXX.—*ACROSTICHUM*. Sori spread all over the back of the frond, not in dots or lines.

SUB-ORDER IV.—*OSMUNDACEÆ*. Capsules stalked, opening at the top, and having an incomplete ring horizontally round one side. Vernation circinate.

Genus XXXI.—*OSMUNDA*. Fertile pinnæ, with almost no lamina.

Genus XXXII.—*TODEA*. Sori on the back of ordinary pinnæ.

SUB-ORDER V.—SCHIZÆACEÆ. Ring of capsule horizontal, confined to the upper portion. Capsule opening down the side. Vernation circinate.

Genus XXXIII.—SCHIZÆA. Fertile segment pinnate, at the top of a grass-like frond. Barren frond grass-like.

Genus XXXIV.—ANEIMIA. Fertile part of frond distinct, without lamina, much branched, rising from the base of a pinnate, leafy, barren frond.

Genus XXXV.—MOHRIA. Capsules marginal, or nearly marginal, on ordinary fronds.

SUB-ORDER VI.—MARATTIACEÆ. Capsules united in a double line into a concrete sorus. Sori on the back of ordinary pinnae. Vernation circinate.

Genus XXXVI.—MARATTIA. Characters as above.

SUB-ORDER VII.—OPHIOGLOSSACEÆ. Capsules without a ring, permanent, and united into a line on each side the spike, which is separate from the barren pinnae. Vernation erect.

Genus XXXVII.—OPHIOGLOSSUM. Fertile segment of frond, simple.

ORDER II.—EQUISETACEÆ.

Fertile cone terminal on the stem, and formed of numerous, peltate receptacles, under the margin of which are placed the capsules, containing uniform spores, each with four hygro-metric filaments attached.

Genus XXXVIII.—EQUISETUM. Characters as above.

ORDER III.—LYCOPODIACEÆ.

Capsules uniform, placed singly in the axils of ordinary leaves ; or of bracts arranged in terminal spikes.

Genus XXXIX.—LYCOPodium. Capsules reniform, one celled, opening lengthways along the top.

Genus XL.—PSILOtum. Capsules three-lobed, three-celled, each cell splitting down its centre.

ORDER IV.—SELAGINELLACEÆ.

Capsules of two kinds placed in the axils of leaves or bracts, those with large spores having several spores in each capsule.

Genus XLI.—SELAGINELLA. Capsules one celled, two valved, arranged in the axils of bracts in a terminal spike; the smaller kind toward the apex, and the larger kind toward the base of the spike.

Genus XLII.—ISOETES. Capsules one celled, placed in the axils of the ordinary rush-like leaves; those with large spores in the outer leaves, and those with small spores in the inner.

ORDER V.—RHIZOCARPEÆ.

Spores of two kinds, the sporangia for the larger spores containing only one.

Genus XLIII.—AZOLLA. Capsules in the axils of the leaves, of two kinds, the larger round containing numerous minute spores, the smaller ovoid containing one large spore.

Genus XLIV.—MARSILIA. Sporangia of large and small spores both attached together in groups, which are fastened to a mucilaginous connecting cord, and enclosed in the two-valved stalked capsule.

DESCRIPTIONS OF THE SPECIES.

(Technical terms and contractions for the names of botanists or books are explained in the Glossary at the end.)

ORDER I.—FILICES.—FERNS.

SUB-ORDER I.—GLEICHENIACEÆ.

Genus I.—GLEICHENIA. Smith.

Rhizomes widely creeping, slender. Fronds distant, dichotomous, or repeatedly dichotomous, the ultimate branches with pinnately arranged pinnules. Sori on the back of the pinnules, composed of few capsules, without indusium. Capsules sessile, with a very wide, complete ring, and opening vertically by the separation of two joints of the ring.

These beautiful ferns are distinguished at a glance by the dichotomous branching of the fronds, which occurs in no other South African genus. In the centre of each fork is a bud, and sometimes the one at the first fork develops late in the season into a strong branch, also dichotomously branching, thus giving the frond a somewhat pinnate appearance. The *Gleichenias* are quite distinct in appearance, and equal in beauty most ferns, but, unfortunately, do not readily adapt themselves to cultivation, and are seldom seen away from their native habitats. They are distributed through most of the Southern Hemisphere.

Key to the species :—

§ Pinnules nearly as broad as long. Sori at the apex of a veinlet. (*Engleichenia*.)

1. *G. polypodioides*.

§§ Pinnules much longer than broad. Sori medial on a veinlet. (*Mertensia*.)

2. *G. umbraculifera*, pinnules occurring on all the dichotomous branches.

3. *G. dichotoma*, Pinnules on the terminal pinnæ, but absent from the lower dichotomous branches, where each fork is subtended by a pair of small pinnated pinnæ.

1. GLEICHENIA POLYPODIOIDES. Smith.

Plate 1. Natural size. b Part of pinnæ, magnified. c Capsule, much magnified.

Rhizome very long, often four to six feet, much branched, slender, about one line diameter, when old, brown and polished, like stout copper wire, but when young covered with star-like tufts of black hairs. The rhizome mostly runs along the surface of the soil, rooting down into it, but is sometimes scandent or sub-scandent, or hanging in masses over the top of a rock. Fronds one to three feet long, on brown polished stalks, which are either hairy at the base only, when quite young, and afterwards glabrous ; or else woolly-tomentose, especially at the forks. Frond dichotomously branched several times, the ultimate branches, as well as all the branches down to the first fork, set with numerous pinnately arranged pinnæ, one to four inches long, two to three lines broad, divided down to the rachis into closely set, bluntly-pointed pinnules, 1 line broad, 1 to $1\frac{1}{2}$ lines long. The central buds in the lower dichotomous forks frequently develop into branches, again repeatedly dichotomous, but without pinnæ along the main rachis. Fronds are green on the upper, and more or less glaucous on the under surface. In young plants the pinnules are frequently four to five lines long, but as the plant gets older the pinnules become shorter and more rounded. The sori are sunk, pit-like, into the substance of the frond, one in the upper axil of each fertile pinnule, at the end of a veinlet, and contains three to four large capsules each, which fall off soon after mid-summer.

Schlechtendal makes two varieties, viz. :—

A. vulgaris, pinnules green on underside.

B. argentea, pinnules glaucous on underside.

Kunze makes three species, viz. :—

11. G. POLYPODIOIDES, Sm.

12. G. glauca, Sw., with varieties $\left\{ \begin{array}{l} \text{A. normalis.} \\ \text{B. nudiucscula.} \end{array} \right.$

13. G. argentea, Klf.

He remarks, however, that G. polypodioides appears to belong

to *G. glauca*, and that *G. argentea* is intermediate between them. Later authorities maintain *G. argentea* as a variety of *G. polypodioides*, and omit *G. glauca*; but Baker recognises only one form. Some specimens have longer pinnules, some are more glaucous, and some have the rachis quite set with woolly, ferruginous shag, while others are naked; but all these conditions can be found in one clump, and are caused by surrounding circumstances: and though in dried specimens they may appear distinct forms, still in growth they cannot be separated.

Gleichenia polypodioides, Smith; Schl. Adum. 11; Thunb. prod. 173; Thunb. Flor. Cap., 377; Schk. Fil., 150, t. 149; Kunze in Linnæa, 10, 489; Pappe and Rawson, 10; Wood's Natal Ferns, 3; Kuhn Fil. Afr., 167; Hk. and Bkr. Syn. Fil., 11.

Gleichenia glauca, Sw. (non Hooker) Kunze Linnæa, 10, 489.

Gleichenia polypodioides, var. *B. glauca*, Hk. Sp. 1, 3; Pappe and Rawson, 10.

Gleichenia argentea, Kaulf. Enum. Fil.; Kunze, Linnæa, 10, 490; Pappe and Rawson, 10.

Onoclea polypodioides, Linn. Syst. Veg.

Known only in South Africa, nowhere common, but occasional on damp rocks in Cape Colony, more frequent in Natal, and found north to Angola.

West.—Table Mountain, Grenadendal, Tulbagh (Pappe), Cedernbergen (Drège), Krom River (Kze), Zoudereinde.

East.—S.W. side of Van Staadensberg (Burchell, 4712), Van Stadens River (E. and Z.), Tzitzikama (Atherstone), Fern Kloof, and Howison's Poort, Grahamstown.

Kaff.—Perie Mountain, above Kabula, Glen Gray (Barker).

Natal.—Inanda, Noodsberg, and through mid-Natal (Wood), Umpumulo (Buch.), Umlaas, and Maritzburg (M'Ken.).

Transvaal.—Magalisbergen (M'Ken.).

Free State.—Rouxville dist.

2. *GLEICHENIA UMBRACULIFERA*. Moore.

Plate 2. Natural size. b pinnules, with sori.

Rhizome mostly underground, several yards in length, two to three lines in diameter, at first set with brown scales, afterwards bare and shining. Fronds two to four feet high, more or less fan

shaped, sometimes only once forked, in other cases repeatedly dichotomous, and with the central bud developed into branches, which are again repeatedly dichotomous. The terminal pinnæ are three to six inches long, one to one and a half inches broad, tapering to the point, and divided to the rachis into numerous close pinnules, one half to one inch long, and one line broad. These pinnules are also produced all along every branch down to the first fork (except the first length of a developed central bud), and usually the lower pinnules of a branch are smaller than the others. Stem, rachis, and buds, densely covered with light brown, woolly tomentum, which soon gets rubbed off the exposed parts, leaving them brown and shining. Pinnules glaucous on the underside, linear, undivided, and bearing six to ten sori each, which are not sunk into the frond, but consist each of four to five capsules, surrounding a raised receptacle.

Gleichenia umbraculifera, Moore ; Hook. Syn. Fil., 13 ; Kuhn, Fil. Afr., 168 ; Wood's Natal Ferns, 4.

Mertensia umbraculifera, Kunze, Linnæa, 18, 114 ; Pappe and Rawson, 10.

Found only in South Africa, from Kaffraria northward, growing in dense masses on steep grassy banks, often fully exposed to the sun, at 2000 to 4000 feet alt. Never found inside thick bush, but often just above it.

Kaff.—Mount Bazija, Transkei (Baur.), Kubusie (A. E. Murray), Perie Mountain, near Bailey's Grave, and above Perie Mission Station. Dolme Hill above Stutterheim, and frequent in upper streams of Toise River.

Natal.—Great and Little Noodsberg (Wood), Greytown, Maritzburg, Richmond (M'Ken.), abounds on Drakensberg at Cathkin, Umpumulo (Buch).

Transvaal, near Leydenburg (Dr. W. G. Atherstone), Pilgrim's Rest (W. Roe).

3. *GLEICHENIA DICHOTOMA*. Willd.

Plate 3. Natural size. b part of pinnule, with sori.

Frond repeatedly dichotomous, and often with the central buds developed ; but the branches are all without pinnules,

except the terminal ones, which are six to fifteen inches long, one to three inches broad, tapering both to the base and to the point, and cut throughout, almost to the rachis, into linear pinnules one line broad, one to one and a half inches long, undivided, with a wide base, and a blunt or notched, or frequently one-sided point. The lowest pinnule on the lower side is generally elongated, and sometimes lobed, while at each forking of the branches arise a pair of small pinnæ, two to four inches long, one half to one inch broad, divided into pinnules like the terminal pinnæ, or lobed or sinuated, especially towards the base, but with the lowest lobe also enlarged.

Sori of six to eight capsules, surrounding a raised receptacle, placed near the middle of a vein. The frond is glaucous on the under surface, and quite glabrous throughout on the Natal specimens, though it is described as being sometimes densely tomentose abroad, as well as changeable in cutting, but characterised by the small pinnæ at the base of branches without pinnules.

Gleichenia dichotoma, Willd ; Kuhn Fil. Afr. 167 ; Hk. and Bkr. Syn. Fil. 15.

Mertensia dichotoma, Kunze, Linnæa 24, 247 ; Schk, Fil. tab. 148.
Mesosorus, Haask.

Found throughout the tropics, but known in extra-tropical South Africa only in Natal, where it was discovered by Gueinzus (*vide* Kuhn), and re-discovered in 1874 by Rev. J. Buchanan, at Umpumulo, "on moist open slope, facing south, in bush near the top of a hill, two miles W. by S. of the mission station, about 2500 feet."

SUB-ORDER II.—HYMENOPHYLLACEÆ.

Genus II.—HYMENOPHYLLUM. Hooker.

Very delicate little plants, with creeping, and generally matted, slender rhizomes, growing in tufts on stones or trees, where there is constantly a saturated atmosphere. Fronds pellucid, consisting mostly of winged veins. Involucre terminal on some of the pinnules, composed of two flattened or concave valves, connected at the base, and containing between them the prolonged apex of

the vein, which becomes an elongated receptacle, surrounded by capsules on all sides, and often with a point extending beyond them. Capsules flattened, surrounded by an obliquely transverse entire ring, and bursting irregularly. The genus contains many species, mostly tropical or sub-tropical.

Key to the species :—

§ Fronds glabrous, not toothed.

4. *H. rarum*, rachis winged, frond bipinnatifid, pinnules wide.

5. *H. gracile*, rachis not winged, frond tripinnatifid, pinnules narrowly linear.

§§ Fronds ciliated and hairy.

6. *H. obtusum*, rachis winged, frond ovate-triangular.

7. *H. lineare*, rachis not winged, frond linear lanceolate.

§§§ Fronds toothed at the margin. (*Leptocionium*, Presl. ; and *V. D. Bosch.*)

8. *H. Tunbridgense*, involucre toothed ; var. *Wilseni*, involucre entire.

4. *HYMENOPHYLLUM RARUM*. R. Br.

Plate 4, fig. 2, natural size. b pinnule, and involucre enlarged.

Rhizome very slender, black. Stalk one inch long, slender. Frond pinnate, one to four inches long, four to eight lines broad at the base, tapering upward, pendant from the top of the stalk. Rachis winged for most of its length, pinnæ neither toothed nor hairy at the edge, lower side undivided, upper side with three to five blunt pinnules, each one to three lines long, one line broad ; upper pinnæ simple or forked, involucre inflated, wider and shorter than in the other species, lobes often one line broad, a half line long, divided to the lamina, and light coloured.

Sori terminal on the upper pinnæ, or on the pinnules nearest the rachis lower down.

Some of the Table Mountain specimens are much larger than usual, four inches long, a half inch wide, and tapering below ; others one inch wide, and deltoid, but all having the involucre as wide as, or wider than, the segments.

H. rarum. R. Brown in *Prod. Flor. Nov. Holl.* 159 ; *Hk. and Bkr. Syn. Fil.* 58 ; *Pappe and Rawson*, 137.

H. semibivalve. *Hk. and Gr. Ic. Fil.*, tab. 33.

II. Thunbergii. *Ecklon.* (teste Kuhn, but not Schl, nor Kunze).

H. Natalense. V. D. Bosch. Syn. Hym., 46.

H. Zeyheri. V. D. Bosch.

H. tabulare. V. D. Bosch.

H. fumarioides. Bory, Willd ; Schl. Adum., 56 (tab. 35 ined) ; Kunze, No. 114 ; Kuhn Fil. Afr. 39.

H. flabellatum. Kaulf.

H. capense. Schrader, Gott. Gel. Anz., 1818, p. 919.

South Africa and islands of South Pacific Ocean.

West.—Table Mountain and Devil's Mountain, 2300 feet (Bolus), Grendendal, Hottentots' Holland (Lady Barkly).

East.—Van Staden's River (Ecklon, Drège), Howison's Poort, Blockhouse Kloof, and Dassie's Kranz, Grahamstown (Dr. Atherstone).

Kaff.—Above Perie Mission Station.

Natal.—Collected by Gueinzus, but not found by Buchanan or M'Ken, though the latter gives as recorded localities, Fort Buckingham, Kranz Kloof.

5. *HYMENOPHYLLUM GRACILE.* Bory.

Plate CXLV. Fig. 1. Nat. size. b part of frond, enlarged.

Rhizome slender, wide creeping, wiry. Frond three pinnatifid, deltoid, three inches long, one to two inches broad, on a wiry stipe one to two inches long. Rachis zig-zag, slightly winged upward, entirely without wing in the lower half, and bearing alternate pinnæ a third to half-inch apart. Pinnæ deltoid ; the lower, which are largest, one inch long, and a half-inch broad at the base ; cut to the slightly-winged rachis into three to four pairs of pinnatifid pinnules with four to five linear segments, those above gradually less divided, and with the pinnules linear and undivided. Pinnules (or segments) half a line broad, one to two lines long, distant, blunt, and with entire margins. Sori terminal on the pinnules of the upper pinnæ, about as broad as the pinnule, hardly longer than broad, with roundish triangular valves cut about halfway down. Not unlike *H. Tunbridgense*, but with entire margins and terminal sori.

H. gracile. Bory ; Hk. and Bkr. Syn. Fil., 58.

H. inæquale. Desv., Poir, Kuhn, Fil. Afr., 40.

Bourbon, Mauritius, Madagascar, and Natal.

This species is only known from South Africa by specimens at Kew in the Rawson Herbarium, from Pietermaritzburg, Natal

(Sanderson 1863), which I have been unable to see ; but description and figure are from Mauritius specimens kindly forwarded to me from Kew.

6. *HYMENOPHYLLUM OBTUSUM*. Hk. and Arn.

Plate VI. Fig 1. Natural size. B. Stellate hair, magnified.

Rhizome long, running, slender. Stipe one inch or more, hairy above. Frond two to three pinnatifid, one to three inches long, three-quarters to one inch broad at the base, ovate triangular, and set all over with numerous brown, stellate, stalked hairs. Rachis winged throughout ; upper pinnae simple or forked ; lower pinnae pinnately cut nearly to the mid-rib, into three to five linear-oblong pinnules, two to four lines long, one line broad.

Sori not seen, but described in Hk. and Bkr. "*Syn. Filicum*" as "two to six to a pinna, terminal on the lateral segments. Involucre as broad as the segments, divided about halfway down, valves rounded, strongly ciliated." Some of the Table Mountain specimens are four to six inches long (including stipe), two inches broad, and with lower pinnae two pinnatifid, and as large as the whole frond usual size. A barren specimen from Knysna collected by Miss Rex, and marked in Herb. Gub. H. lineare, is evidently this species, but is hairy on one side only, while the Table Mountain plant is hairy on both sides.

The Table Mountain locality is mentioned in 1st edition of *Syn. Fil.*, but omitted in the 2nd edition, where Sandwich Islands is the only locality given. It is also omitted by Kuhn, but he credits to the Cape the very closely allied *H. æruginosum*, Carm.

Lady Barkly distributed many specimens from Table Mountain, and the exact locality is well known to several Cape Town botanists.

In Mr. Marquardt's fern grotto, plants of this species originally from Table Mountain are growing well. From Mrs. Young I received a few fronds of this, mixed among *H. Tunbridgensis*, but without locality. Her specimens are mostly from Kaffraria and Natal.

7. HYMENOPHYLLUM LINEARE. Sw.

Plate V. Natural size.

Frond pinnate, elongating from the point, each season's growth lanceolate in outline, widest at the middle, and tapering to both ends ; about three inches in length, and a half to one inch broad. Three to six of these season's growths or fronds, placed one above another, are sometimes to be found, and, as they are very slender, wavy, and flaccid, they form a tangled mass in growth. Rachis not winged, but ciliated like the rest of the frond. Pinnæ five to eight lines long, three lines broad, divided to a winged mid-rib, into three to seven simple, or forked, pinnules, which are oblong, one line broad, one to one and a half lines long. Pinnæ closely set, more or less overlapping. Sori terminal on lower pinnules, with ciliated lobes.

H. lineare. Swartz. Hk. and Bkr. Syn. Fil., 66.

H. elegans. Spr. Hk. Sp. 1-91.

H. trifidum. Hk. and Gr. Ic. Fil., t. 196.

H. pendulum. Bory.

H. capillare. Desv. Kuhn, Fil. Afr., 38.

Found in Tropical America and Mauritius. I have seen no South African specimen, but Lady Barkly and Buchanan give "Macamac, Transvaal Gold Fields, specimens recently sent by Mr. Ayres."

8. HYMENOPHYLLUM TUNBRIDGENSE. Smith.

Plate IV. Fig 1. Natural size. c Do., grown in shade. b Pinnule and involucre, enlarged.

Rhizome slender, black, short jointed. Frond tripinnatifid, little more than a series of winged veins, very irregular in outline, often triangular, six to eight lines long, four to six lines broad, but frequently lanceolate or ovate-lanceolate, with the lower pinnæ more or less reduced, and ranging up to four inches in length, one to one and a half inches broad. Stem not winged ; rachis narrowly winged in the upper half ; pinnæ bipinnatifid, with a winged rachis, or in dwarf-grown specimens flabellate. Pinnules linear, one third of a line broad, strongly toothed. Sori on the lower pinnules of the mid pinnæ, solitary, terminal on side pinnules.

Involucre cut to the base into two flattened, circular, semi-divergent, strongly toothed lobes ; between which is the globular mass of capsules on a short receptacle.

This is a little beauty, growing in dense masses several feet square, on, or near, the solid rock, in the Forest region. During dry weather the masses of this look like carpets of nearly black shrivelled moss, but when transferred to a moist, close position, and kept constantly damp (as in Mr. Marquardt's fern grotto, Cape Town), it develops into a much larger, and more delicate plant, of a pellucid light green colour, quite unlike its former self, and unequalled, in fragile beauty, by any other fern we have.

In Government Herbarium are specimens with fronds three inches long, one inch wide, on top of leafless stalks six inches long ; more divided than the ordinary form, and with very large involucre. Also a barren specimen, with rachis entirely without wing, and the three to five pinnuled pinnæ with very narrow drooping pinnules. Kunze mentions a form which he calls var. *β. pedunculatum*, having fertile segments attenuate to the point, and the involucre smaller and oval. All these forms appear to be dependent on conditions of growth, and can hardly rank as varieties.

H. Tunbridgense. Smith. Thunb. Flora. Cap. 737 ; Schl. Ad. 55 ; Schk. Fil. 134 ; tab. 135 d. ; Kunze, Linnæa, 10, 554 ; Pappe and Rawson, 44 ; Wood's Natal Ferns, 5 ; Hk. and Bkr. Syn. Fil. 67 ; Kuhn, Fil. Afr. 42.

H. Dregeanum. Presl.

H. Thunbergii. Ecklon, in Sched. pl. exs. union. itin. No. 92 (teste Kunze, but not Kuhn).

Leptocionium. V. D. Bosch.

Found in most parts of the world, from the tropics to Norway. In South Africa widely distributed, and not uncommon in the forest, but often overlooked, or passed as *Trichomanes pyxidi-ferum*, which, eastward is the more common plant, though in the west *H. Tunbridgense* takes its place.

West.—Table Mountain, Hottentot's Holland, &c. (P. and R.), Kirstenbosch, 1500 feet (Bolus), Tuliagh (Ecklon), Knysna, Koratra (Drège).

East.—Bedford (Holland).

Kaff.—Perie Mountain, and Frankfort Hill, toward the top.

Natal.—Kranzkloof, Maritzburg, Noodsberg, Karkloof (M'Ken), Umpu-
mulo (Buch.), Midland and upper districts, plentiful (Wood).

H. WILSONI, Hk., differs from H. Tunbridgense in having pinnules on the upper side only of the pinnæ, and in the involucre being entire. The two generally grow in company, and intermediate forms occur connecting them. In Europe they are regarded as distinct varieties, but I have seen nothing here answering to H. Wilsoni; nor is it included by Pappe and Rawson, Lady Barkly, or M'Ken, though Kuhn includes it from Cape and Natal under the name of H. peltatum, Desv.; and Buchanan finds it mixed with H. Tunbridgense in Natal, while the South African H. Meyeri, Presl., is founded on it.

Genus III.—TRICHOMANES. Smith.

Rhizome creeping, slender, matted or branched, and bearing pellucid tender fronds, similar in habit and texture to the Hymenophylla. Sori terminal on a pinnule, or sunk into its apex. Involucre tubular with a rim, or two lipped at the mouth, but not deeply divided, and having the end of the vein prolonged as a central receptacle, bearing capsules as far as enclosed in the involucre, but often having a filiform point without capsules extending beyond. Capsules as in Hymenophyllum. The Trichomanes are delicate little plants, requiring abundant moisture, but easily cultivated where that is obtainable.

The genus is closely allied to Hymenophyllum, and has many species; widely distributed in the warmer regions, and some extending into the temperate zone.

Key to the species :—

9. *T. muscoides*, var. Fronds shortly stalked, nearly entire, or bluntly lobed; involucre sunk in the frond.
(*T. digitatum*. Fronds stalked, deeply divided into linear ciliated segments; involucre sunk in the frond).
10. *T. pusillum*. Fronds almost sessile, irregularly pinnatifid, slightly ciliated; involucre not sunk.
11. *T. pyxidiferum*. Frond three pinnatifid, rachis winged above.
12. *T. rigidum*. Frond three to four pinnatifid; rachis not winged, or winged only at the summit.

9. *TRICHOMANES MUSCOIDES*. Sw. Var.

Plate CXLV. Fig. 2. Nat. size. c part of frond, enlarged.

Mr. J. M. Wood writes me—"In 1887 I gathered a *Trichomanes*, which I at the time took for *T. Quercifolium*, plants of which I wanted for a correspondent at home. It was put into a small tin, and posted without examination, reached home in good order, and was found not to be *Quercifolium*. I much regret I have no specimen. My correspondent wrote me, July 28, 1887—"It is exactly like some which were sent me from Singapore as *T. muscoides*, so I sent a bit to Kew. Mr. Baker says it is certainly not *Quercifolium*, nor is it typical *muscoides*, so he calls it a variety of the latter.'"

T. muscoides is distinguished from *T. pusillum* by having the involucre sunk into the frond with only the mouth free, and that surrounded by a rim, but hardly two lipped. The frond, like that of *T. pusillum*, varies considerably in outline; sometimes lanceolate lobed; more frequently when full sized obovate or oblong, with a cuneate base; a half to one inch long, a quarter to a half inch broad, with a slender stipe a half inch or more long, and either entire or divided along the margin into several short rounded lobes. Sori terminal on the veins in the upper lobes, sunk entirely into the lamina with a free spreading rim, hardly two lipped. When young the fronds are set with simple or stellate hairs which soon disappear. The stipe is continued through the frond as a strong mid-rib, pinnately forked into the lobes, and the strongest again forked or pinnate. Besides these veins there are numerous parallel venules not connected with these primary veins, but connected along the margin by a more or less distinct marginal vein. The above description and figure are from specimens from Fernando Po, kindly forwarded to me from Kew.

(*TRICHOMANES DIGITATUM*. Swartz.

Plate CXLV. Fig. 3. Nat. size. d margin magnified.

Rhizome very slender, wiry. Frond one to two inches long, one inch broad, on a wiry stipe one inch long or less; very irregu-

lar as to cutting, but generally flabellate or sub-pinnate in general outline; cut throughout into simple or forked linear pinnules, a half to one inch long, one line broad, and with one central vein in each; the main rachis when present winged like the other segments. Margin slightly toothed, with a hair point on each tooth. Involucre terminal on the upper pinnules, and quite sunk into the lamina, with short round spreading lobes.

This species is a native of the Mascarene and Polynesian islands, and is still given in "Synopsis Filicum" as a Cape plant on Dr. Brown's authority; but it has not been found by any collector since, and no Cape specimen exists in the Colonial Herbaria, nor is it in Kew Herbarium from the Cape.

Can it have originated from small barren plants of *Hymenophyllum obtusum*?

My description and figure are from Samoan specimens, kindly forwarded to me from Kew.)

10. *TRICHOMANES PUSILLUM*. Swartz.

Plate VI. Fig. 2. Nat. size. b margin and hairs, magnified;
c involucre magnified.

Rhizomes long, slender, and coated with short black shag. Fronds sessile or almost so, glaucous green, membranaceous, very irregular in outline, sometimes linear-oblong and sinuate, more frequently obovate from a cuneate base, deeply pinnatifid into rounded, irregular pinnules, more or less wavy at the margin, and with frequent blunt lobes or teeth, crowned by two or more sessile hairs arranged stellate fashion. Fronds a half to one and a half inches long, a quarter to three-quarter inch broad, and bearing the sori terminal on the veins in the upper part. Involucre quite exserted, tubular from a contracted base, and having two large semi-circular lobes at the mouth. Receptacle twice as long as the tube, but bearing capsules only on its lower half. The veins are pinnately arranged, but numerous; spurious venules exist, generally leading up to the tufts of hairs.

Var. *QUERCIFOLIUM*, Hk. and Gr., (Plate VI., Fig. 3) is larger, with upper pinnæ three-quarter inch long, and more or less

pinnatifid again, but grows among the other, and seems only to be more luxuriant specimens.

T. pusillum and *T. muscoides* are evidently very closely related, and may possibly, when known in growth, be passable as forms of one species; but Kuhn considers our present plant distinct from the South American *T. pusillum*, Sw., and places it in another South American species, *T. reptans*, Mett., var. *major*, Mett.

T. pusillum, Swartz. Hk. and Bkr. Syn. Fil. 77; Wood's Natal Ferns, p. 6.

T. quercifolium. Hk. and Gr. Ic. Fil., tab. 115; Hk. and Bkr. Syn. Fil. 465.

T. Robinsoni. Hk. MSS.

T. reptans. Mett. Var. *major*, Mett; Kuhn 37.

Hemiphlebium. V. D. Bosch.

On damp rocks in the up-country districts of Natal, Inanda (Wood), Kranzkop, Swartzkop, Maritzburg, Noodsberg, Nottingham (M'Ken), Kranzkloof, Umpumulo (Buchanan).

11. *TRICHOMANES PYXIDIFERUM*. Linn.

Plate IV. Fig. 3. Nat. size. b pinnule and involucre, enlarged.

Rhizome slender, branching, set with black shag. Frond one to four inches long, one inch broad, tripinnatifid, ovate-oblong, rounded at the point, and set on a slender wiry stalk, half-inch or more long. Rachis narrowly winged down to near the lowest pinnæ. Pinnæ longest at or above the middle of the frond, a half to three-quarter inch long, half inch broad at the base, cut in a pinnate or flabellate manner to the winged mid-rib, into narrow, linear, pinnatifid, dichotomous or forked membranaceous pinnules, having one vein in each segment. Margin not toothed. Sori terminal on the inner segments of the larger pinnæ or axillary. Involucre cup-shaped, with a slightly expanded rim, generally more or less two lipped, not toothed. Receptacle central, often much longer than the involucre, but bearing capsules only on the lower part.

In general appearance this is very much like *Hymenophyllum Tunbridgense*, from which it is distinguished by the involucre as

well as by having the margin of the pinnules quite destitute of teeth. It also has a narrow green edging or wing down the side of the rachis, though this disappears in the lower part, and the slender rhizomes are matted with short black shag. It is seldom in such dense masses as the *Hymenophyllum*, has more widely spreading rhizomes, and grows among moss, on stones, trees, and on the ground in every damp part of the forest. When young the involucre is often compressed and the edges folded together so as to be two lipped, and this is occasionally seen in older specimens when it comes to be *T. filicula* Bory, but these specimens are otherwise identical with *T. pyxidiferum*. In the "Synopsis Filicum," where the two are maintained as distinct species, both widely distributed, the Cape is given as a locality for each. Pappe and Rawson find *T. filicula* the common plant, and *T. pyxidiferum* from Natal only. In other countries they may be distinct, but I agree with Lady Barkly and Buchanan in recognising only one species, and not even two good varieties, in South Africa. Kuhn also does so, but considers it distinct from *T. pyxidiferum*, Linn., and calls it *T. melanotrichum*, Schl.

T. pyxidiferum, Linn. Pappe and Rawson, 45; Hk. and Bkr. Syn. Fil. 81.

T. melanotrichum, Schl. Adum. 56; Kunze, Linnæa, 10-74; Pappe and Rawson, 45.

In moist close places, on trees and rocks throughout most tropical and sub-tropical countries, abundant in Natal and Eastern District, more rare West.

West.—Grenadendal (P. and R.), Plettenberg Bay (Mund).

East.—Abundant at Grahamstown, Bedford, &c.

Kaff.—Plentiful throughout the forest region, Transkei (Bowker).

Natal.—Inanda (Dr. Rehmann, 8194), Umpumulo (Buchanan), common in the Midland and Upper district (M'Ken).

Transvaal, Macamac, and Pilgrim's Rest (M'Lea. and Herb. Bolus. 3019).

12. *TRICHOMANES RIGIDUM*. Sw.

Plate VII. Nat. size. b pinnule, enlarged. c involucre, enlarged.

Rhizome short, stout, set with lanceolate dark scales, and with the fronds more or less tufted, three pinnate or four pinnatifid, dark green, and leathery in texture. Stalk three to six inches

long, black, wiry, slender. Frond three to eight inches long, three to five inches broad at the base, and tapering to the point. Main rachis and rachis of pinnæ wiry, and winged only toward the point. Lower pinnæ two inches long, one inch broad at the base, with five to six pairs of secondary pinnæ a half to one inch long, a half inch broad, and cut to a winged mid-rib in lobed or pinnate pinnules, with narrow linear segments. Sori small, one or more on each secondary pinna, axillary on the inner base of a pinnule. Involucre free from lamina, cylindrical, slightly widened at the mouth, but not two lipped. Receptacle twice as long as involucre, but bearing sori only inside it.

T. rigidum, Swartz. Kunze, *Linnæa*, 10, 553; Pappe and Rawson, 45; Kuhn, *Fil. Afr.* 37; Hk. and Bkr. *Syn. Fil.* 86.

T. Dregei. V. D. Bosch.

T. Harveyi. Carruthers.

Widely distributed in the tropics and sub-tropics, in damp close places near streams. Stated in "*Syn. Fil.*" to belong to Cape Colony, but I have heard of no locality there for it.

Natal.—Inanda (Dr. Rhemann, 8193), Kranskloof, Great Noodsberg, Umhlasine, Attercliffe (M'Ken), Umpumulo (Buchanan), Omsamcaba (Drège).

Transvaal, Drakensberg near Macamac (J. H. M'Lea).

SUB-ORDER III.—POLYPODIACEÆ.

Genus IV.—CYATHEA. Smith.

Tree ferns with stout erect stems several feet in height, and mostly with three—to four—pinnate fronds. Sori several on a pinnule, at first completely enclosed in the involucre, which bursts at the top, and remains under and around the capsules. Capsules surrounding a raised globose receptacle. This genus contains many species, mostly of similar habit, distributed through the tropics and a short distance beyond them. Several are African, but only one extends to our district.

13. CYATHEA DREGEI. Kunze.

Plate VIII. Plant much reduced. b Part of frond, natural size.

Stem erect, tree-like, generally six to seven feet high, but often

ten, and sometimes fifteen feet in height, and eight to twelve inches in diameter. Fronds three to five feet long, one to one and a half feet broad, arranged in a crown at the top of the stem, more or less arching, and with the points turned upward. Fronds three pinnate, firm in texture, dark green above, lighter on the under surface. Crown densely set with narrowly lanceolate shining brown scales, one to one and a half inches long, one line broad. Base of the stipe set with short soft prickles, which become harder and more apparent when the frond withers. Rachis and underside of pinnules more or less densely covered with brown woolly tomentum, which is more abundant when fertile, and then mostly among the sori. Stipe also paleaceous at first. Pinnæ twelve to twenty pairs, pointed, from a base three inches broad ; lower pinnæ reduced, and frequently a pair of small pinnæ similar to the others occur close to the crown. Pinnules lanceolate, widest at the base, pointed, cut to the rachis into oblong sub-falcate segments, which are bluntly pointed, and either entire or toothed. Sori at the base of the segments, one to three pairs on each. Capsules numerous from a globular receptacle, involucre remaining saucer-like, with an irregular margin, under the mass of capsules. Stem usually single, but sometimes branched into two or more.

This splendid tree fern grows generally on exposed and bare hillsides, but is sometimes among small bush, when the stems are longer and more slender. The young plants require the shelter obtainable at the rise of a water course, but when fully grown they stand erect, exposed to the full sun, and not unlike Cycads at a distance. When in this kind of situation they exhibit the stout stem, and short arching fronds shown in our figure, but when in a deep hollow or in shelter the fronds are more upright in habit. Many stems of this fern have been exported to Europe and travel well, but it requires very careful treatment to keep an old stem healthy for many years after it is transplanted from its native damp uplands down to the drier country below. It is easily cultivated if begun small, but if lifted when fully grown generally lives but one year. The small seedling plants very much resemble the ordinary British form of *Nephrodium Filix-mas*.

Cyathea Burkei, Hk., seems to be the same thing grown under shade, and consequently of less firm texture, and with the lamina of the frond more expanded, less fertile, and less woolly.

Cyathea Drègei. Kunze, *Linnaea*, 10, 551; Pappe and Rawson, 11; Kuhn *Fil. Afr.* 164; Hk. and Bkr. *Syn. Fil.* 21.

C. Burkei. Hk. *Sp.* 1, 23.

C. Drègei. Kze. var. *Burkei*, Pappe and Rawson 11.

Known only in South Africa, and extending from Kaffraria to near the Equator, from 2000 feet alt. upward; native name "Isihihi."

Kaff.—Katberg (Holland), Bazija (Baur.), Pondoland (Drège), Toise River, Thomas River, Dohne Hill, Hog's Back, Cathcart, &c.

Natal.—Umzimkulu (Wood), and abundant from Westville and Umbilo Falls to the Drakensberg (M'Ken, Buchanan).

Transvaal.—Magalisbergen (Zeyher), Macamac (M'Lea).

Genus V.—HEMITELIA. Br.

Tree ferns with long stems, and large spreading fronds in a crown at the top. Capsules surrounding a conical receptacle, and subtended by the small involucre, which is like a scale under the under side of the sorus, with an irregular broken margin. A small genus, of which our species is the only one known in Africa, though another has been found in Madagascar. The other species are distributed through the tropics.

14. *HEMITELIA CAPENSIS*. Br.

Plate IX. Plant much reduced. b. Pinnule, nat. size. d. Capsule, magnified.
c. Abnormal pinnæ, nat. size.

Stem erect, treelike, five to fifteen feet in height, three to six inches in diameter, surmounted by a crown of most gracefully arching sub-membranaceous fronds, six to nine feet long, two to three feet broad, 3-pinnate or 3-pinnatifid, and tapering to both ends. When young the stipe and rachis are thickly set with short lanceolate dark brown spreading scales, and the mid-rib of the pinnules and segments with shorter ovate pointed concave scales. As the frond gets older these partially disappear. Pinnæ, twelve to eighteen inches long, four to six inches broad at the base; pinnules

sessile, two to four inches long, half to three-quarter inch broad, cut almost to the mid-rib into strongly toothed, pointed, narrowly oblong segments, which bear one sorus each, placed on the lowest veinlet on the upper side.

Fronds have a bare stipe of two feet or thereby, at the base of which arise a pair of abortive or skeletonised pinnæ (fig. c.), generally without any lamina, or with only a very little, but green and flaccid when young, and not resembling in the slightest degree the pinnæ above. These abortive pinnæ were mistaken by early Botanists for distinct epiphytal ferns, and are believed to have been the *Trichomanes incisum* of Thunberg, though he distinguishes by the fructification the genus *Trichomanes*, of which this, which bears no sori, was his only species ; while *Hemitelia* is not included at all in his flora, unless his *Polypodium capense* be intended for it, and, if so, it is rather strange that the tree-like caudex should not be mentioned. *Trichomanes cormophyllum*, Klfs., is another name for the abnormal pinnæ.

Sori one line long, on a conical receptacle, and subtended on the side next the mid-rib by a small ovate or lobed scale, or involucre, hardly large enough to show from under the capsules, and frequently wanting or falling off early, in consequence of which this species was formerly placed in the genus *Alsophila*, in which there is no involucre. Specimens from Bazija have sori much larger than usual, and sometimes two to a segment, but are otherwise the same as the ordinary form.

Hemitelia Capensis, R. Br. ; Schl. Adum. 55 ; Kunze, *Linnæa*, 10, 552 ; 23, 257 ; Pappe and Rawson, 11. Kuhn, *Fil. Afr.* 162 ; Hk. and Bkr. *Syn. Fil.* 29.

Alsophila Capensis, J. Smith ; Hk. *Sp. Fil.* 1-36.

Amphicosmia riparia. Gardner, *Lond. Jour. Bot.* 1 t. 12.

Polypodium Capense, Linn. ; Thunb. *prod.* 172 ; Thunb. *Flora Cap.* 735. (teste Kuhn).

In moist ravines in shade all through the upper part of the forest region, especially by waterfalls, or perennial dashing streamlets more common inland than on the coast. In Natal in midland districts only, at 2000 to 3000 feet altitude. Found also in Mascerenes and S. America.

West.—Table Mtn., Kerstenbosch, Paradise (Ecklon), Dutoitskloof (Drège), Swellendam (Zeyher), Knysna.

East.—Karakamma; Fern Kloof. Grahamstown (Atherstone); Bedford, &c.

Kaff.—Bazija (Baur.), Katberg (Smith), Perie, Chumie, Dohne Hill.

Natal.—From Inanda to Umpumulo (Buch.), Noodsberg (McKen.)

Genus VI.—WOODSIA. Br.

Small herbaceous ferns, with the sorus at first enclosed in the round involucre, which bursts at the top into several irregular more or less ciliated lobes. A small genus of which we have but one species.

15. WOODSIA BURGESSIANA. Gerr.

Plate LXI. Fig. 2. Natural size. b. pinnule of large frond. c. involucre and capsules, enlarged. d. lobe of involucre, magnified.

Crown tufted; fronds lanceolate, pinnate, four to eight inches long, one to one and a-half inches broad, thinly herbaceous in texture, with longish glandular hairs on the rachis, and shorter hairs on both sides of the pinnæ, but most abundant on the under surface. Pinnæ sessile, bluntly oblong from a wide base, cut halfway to the mid-rib into rounded or oblong toothed lobes, generally bearing two to four sori each, and sometimes with the margin infolded over the sori. Sori of a few capsules, enclosed in a thin globular involucre, which bursts from the top irregularly into three to five lobes. This species is placed in the "Syn. Fil." in the division *Physematium*, distinguished by having a large involucre, and not ciliated at the edges. In the former character it agrees, but I find the lobes ciliated more or less as in fig. d. Several larger and more deeply cut specimens have been seen, and one frond sent by Mr. Wood is fifteen inches long, three inches broad, with pinnæ largest at the middle, there one and a-half inch long, tapering from a base three-quarter inch broad, with about eight pairs of pinnules, (fig. b) cut to the rachis a quarter to three-eighths inch long, one-eighth inch broad, and having about five pairs of lobes, each toothed, and bearing a sorus; whole plant shortly and thinly villose.

W. Burgessiana, Gerrard MSS.; Hk. and Bkr. Syn. Fil. 48; Kuhn, Fil. Afr. 209.

Under rocks, in South Africa only.

Eastern Province and Transvaal (Lady Barkly).

Natal.—Tugela River; Lyndoch Farm, Nottingham; (McKen.) Liddesdale, Karkloof, Mount West, Drakensberg at Cathkin (Buchanan).

Under the name *Woodsia mollis*, J. Sm., McKen gives the description from "Syn. Fil." of that species, and quotes as localities Bushman's River (Gerrard), and Drakensberg. This seems to have been a mistake as it is not included by Buchanan, nor in "Syn. Fil."; while Lady Barkly assumes it to be *W. Burgessiana*. It may also possibly have been some cut form of *Gymnogramme cordata* which occasionally approaches some of the *Woodsias* in appearance.

Genus VII.—DAVALLIA. Smith.

Sori marginal or intra-marginal, roundish, terminal on the veins. Indusium united below and (in our species) at the sides, and open only at the outer edge. A large genus with many species of diverse habit, and some of them having little natural connection with others except the form of the involucre.

Key to the species:—

§ Fronds jointed to the rhizome; involucre coriaceous, marginal; frond firm; rhizome creeping (*Eudavallia*).

16. *D. nitidula*, Frond deltoid, 4 pinnatifid, glabrous, sub-coriaceous.

§§ Stipe continuous with the rhizome. Involucre membranaceous, intra-marginal; rhizome creeping (*Microlepia*).

17. *D. Speluncæ*. Frond deltoid or ovate deltoid, 3-4 pinnatifid, softly herbaceous, villose on the under surface.

§§§ Crown tufted. Sori in marginal pouches at or near the apex of a pinnule (*Loxoscaphe*).

18. *D. concinna*. Frond oblong lanceolate, 2 pinnate, coriaceous, glabrous.

16. *DAVALLIA NITIDULA*. Kunze.

Plate X. Nat. size. b Part of pinnule, magnified.

Rhizome very stout, and set with most abundant linear, almost hair-like rusty brown scales. Frond deltoid, three pinnate, nine to twelve inches long, six to nine inches broad, on a firm wiry

naked yellowish stalk six inches long, channelled along the front, and jointed to the rhizome. Rachis and rachis of pinnæ resembling the stalk, slightly winged only toward the point. Pinnæ alternate, stalked, deltoid, the lower four to six inches long, two to four inches broad at the base, others smaller upward. Secondary pinnæ stalked, alternate, deltoid, and having five to seven pairs of alternate, shortly stalked, ovate, pinnules, which are cut to, or near to the mid-rib, into cuneate five to seven lobed segments, each bearing one or more sori at the apex. Frond glabrous, subcoriaceous, and firm. Involucre pouch-like, leathery, brown, open only at the top, rather longer than wide, terminal on the segments, and surmounted on each side by a point of lamina. Capsules on stalks from the bottom of the involucre. A specimen in Albany Museum is eighteen inches broad and eighteen inches long without stipe, finely cut, and rather sparse.

Kuhn gives this as *D. denticulata*, Mett (*D. elegans*, Sw.), var. *intermedia*, Mett, and M'Ken's *D. elegans* is said by Buchanan to be the same thing, while Lady Barkly calls it a variety, but gives no characters, and M'Ken's description is from "Syn. Fil.," and not from his own plant.

D. nitidula. Kunze, *Linnæa*, 10, 545; Pappe and Rawson, 24: Ilk. and Bkr. *Syn. Fil.* 97.

D. denticulata, Mett, var. *intermedia*, Mett; Kuhn *Fil. Afr.* 158.

Trichomanes Chærophylloides, Poir.

Found on trunks of trees, &c., in sub-tropical South Africa only.

Kaffraria.—St. John's River (Sir H. Barkly), Pondoland (Drège).

Natal.—Coast Bush, and at Umzinyati Falls, and at Umlass, scarce (Wood), Kearsney (Buchanan).

17. *DAVALLIA SPELUNCÆ*. Baker.

Plate XI. Natural size. b Pinnule, enlarged. c Sorus, enlarged.

Rhizome creeping, frond three pinnatifid, flaccid, softly herbaceous in texture, three to four feet long, one to three feet broad, deltoid, ovate, or ovate-lanceolate on a straw-coloured, herbaceous stalk one to two feet long. Pinnæ lanceolate from a

wide base, almost sessile, alternate, usually six to eight inches long, two to three inches broad, sometimes larger. Lower pinnæ about equal to, or sometimes much larger than, those above. Pinnules sessile, one to two inches long, a half to three-quarter inch broad, cut to or near the mid-rib into oblique, rounded, crenate or lobed segments, bearing a sorus below each sinus; Stalk and rachis rough, with short, tubercle hairs, frond finely villose on both sides, especially on the veins. Involucre like a membranaceous scale, with a semi-circular attachment, early deciduous, situated more or less within the margin, and often as in *Nephrodium*. I have seen a specimen with the lower pinnæ two feet long, five inches broad, and with pinnules two to three inches long, one inch broad.

Davallia Speluncæ. Baker Syn. Fil. 100.

Polypodium Speluncæ. Linn.

Microlepia Speluncæ. Moore ; Kuhn, Fil. Afr. 159.

Davallia Polypodioides. Don : Hk. Sp. 1, 181.

Microlepia Polypodioides. Presl ; Pappe and Rawson, 24.

Davallia trichosticha. Hk. Sp. 1, 183.

Davallia Madagascariensis. Kunze, Bot. Zeit.

Widely distributed within the tropics and a little beyond, growing in swamps.

Natal.—Head of Natal Bay (M'Ken), Umpumulo (Buch.).

Zululand.—Itshoa (Buchanan).

Transvaal.—Magalisberg (Zeyher).

18. *DAVALLIA CONCINNA.* Schrad.

Plate XII. Natural size. b. fertile pinnule, enlarged.

Crown tufted, or shortly creeping, and set with lanceolate hard, nearly black scales. Frond lanceolate, nearly glabrous, two to four inches broad, half to two feet long, on a stalk half as long, which is rounded at the back, and furrowed in front, and more or less scaly below. Rachis with a thick rounded wing throughout. Pinnæ and pinnules simply winged veins, but of firm coriaceous texture. Pinnæ alternate, widest at the base, and with three to five pairs of alternate linear or forked pinnules, one line broad, half

inch long, each bearing a nearly terminal sorus, surmounted on the lower side by a rounded wing of lamina. Involucre shortly cup shaped, as wide as the pinnule. Sometimes the habit is closer than figured, and the pinnules only half a line broad and surmounted—candelabra fashion—by the wider saucer-shaped involucre.

Davallia concinna, Schrad. Kze., *Linnaea*, 13-152; Schl. Adum. 55;

Pappe and Rawson, 25; Hk. and Bkr. Syn. Fil. Ed. I, 100.

Davallia thecifera, H.B.K.; Hk. and Bkr. Syn. Fil. Ed. II. 100.

Davallia campyloptera, Kunze, *Linnaea*, 10, 544; Suppl. to Schk. Fil. t. 75.

Davallia Schimperii, Hk. Sp. 1, 193.

Asplenium concinnum, Kuhn, Fil. Afr. 99.

Asplenium theciferum, Mett. Kuhn, Fil. Afr. 117.

Loxoscapha concinnum, and *theciferum*, Moore.

South America, Africa, and African Islands.

This is very like *Asplenium rutæfolium* in habit, habitat, cutting, and texture, and probably often passed as such, but the involucre here is almost terminal and compressed cup-shaped, while in the *Asplenium* it opens along the side of the pinnule as a marginal slit, and is longer than deep.

Epiphytal on trees, mostly inland.

West.—Knysna (Lady Barkly), Plettenberg's Bay (P. and R.), George, Klein Bosch Rivier (Drège).

East.—Brookhuizen's Poort, and Blockhouse Kloof (Dr. Atherstone), Zwart Hoogdens, near Grahamstown (MacOwan).

Kaff.—Katberg (Miss Hartzenberg), Fort Beaufort (Holland), Main. Transkei (Mrs Young), Toise River, and rare in Evelyn Valley, Perie.

Natal.—Umpumulo, Karkloof (Buchanan), Maritzburg, Richmond, Nottingham, Cathkin (M'Ken).

Transvaal.—Houtbosch (Dr. Rehmann, 5606).

Genus VIII.—CYSTOPTERIS. Bernh.

Small delicate ferns, having the sori covered by a scale-like indusium attached under the capsules on the lower side, and at first swollen, and turned hood-like over them, but afterwards burst at the point into several irregular lobes, and soon almost hid by the capsules. A small genus, belonging to the north temperate zone, and only represented south of it by our only species.

19. *CYSTOPTERIS FRAGILIS*. Bernh.

Plate XIII. Natural size. b Pinnule, slightly enlarged.
 c Do., much enlarged.

Crown tufted, or rhizome shortly creeping ; stalks very tender and fragile, green and shining, and with a few scales at the base only. Frond lanceolate, three-pinnatifid, six to twelve inches long, two to three inches broad, glabrous, shining green, herbaceous, and very tender. Pinnæ shortly stalked, widest at the base, more or less united toward the point, but at the base having several pairs of oblong pinnules, which are again pinnately divided into toothed lobes, each bearing one or more sori near the middle of the veinlets, subtended on the lower side by the scale-like, irregularly-lobed indusium, which is connected to the receptacle under the capsules by its wide base. Rachis slightly winged in the upper half. Occasional specimens get two feet long and six inches broad, and resemble in general appearance *Asplenium Filix-fœmina*. The smaller size is more like *Asplenium Zeyheri*, but it is easily distinguished from both these by the shape of the sorus. This is known as the Bladder Fern, on account of the swollen and bladder-like appearance of the indusium in its younger stages. The indusium being torn is not mentioned in "Syn. Fil.," and the figure (tab. II. fig. 19) shows it ovate pointed ; but it is similar to ours in the British plant as described in Sir J. E. Smith's "English Flora," though in Sir W. J. Hooker's "British Flora," 5th edition, and several later works, it is described differently.

Cystopteris fragilis. Bernh. Pappe and Rawson, 16 ; Kuhn, Fil. Afr. 144 ; Hk. and Bkr. Syn. Fil. 103.

Aspidium fragile. Sw. Schk. Ic. Fil., tab. 54-56.

Almost throughout the temperate zones, and on high mountains between ; growing in very close damp deep ravines, or by streams under thick bush.

East.—Bedford and Katberg (Holland), Kat River Mountains (Ecklon), Boschberg (MacOwan).

Kaff.—Above Perie Mission Station, and abundant in a rocky stream at Pontz' Forest, Izeli, 4000 feet alt.

Natal.—Greytown to Drakensberg (Wood), not under 3000 feet alt. (Buchanan).

Genus IX.—LINDSAYA. Dryand.

Small herbaceous ferns, having linear marginal sori, covered by a membranous indusium attached a little within the margin, so that it equals the edge of the frond, and opens outward like a slit along the margin, at the bottom of which, all along, is the receptacle. Several species occur in Madagascar and Mascarenes.

20. LINDSAYA ENSIFOLIA. Swartz.

Plate XIV. Natural size. b Section of pinna, magnified.
c Part of sorus, much enlarged.

Rhizome very short and thick, with lanceolate scales. Stipe three to nine inches long, round, glabrous. Frond six to fifteen inches long, glabrous, firmly herbaceous, simply pinnate, with one to six pairs of pinnæ, and a long terminal one. Pinnæ equal sided, three to six inches long, a quarter to half-inch broad, linear or linear-lanceolate, tapering shortly to the point, and to the slightly stalked base, but otherwise of very equal width. Barren fronds, and the barren tips of fertile fronds, slightly toothed; fertile parts more or less contracted. Sori continuous along most of the fertile pinnæ. Veins uniting freely and forming numerous irregular areolæ.

This has the habit of *Pteris cretica*, but with the sori opening outward.

Lindsaya ensifolia. Swartz. Schr. Jour. 1800; Pappe and Rawson, 25; Kunze, *Linnæa*, 18-121; Kuhn Fil. Af. 67; Hk. and Bkr. Syn. Fil. 112.

Lindsaya pentaphylla. Hk. Sp. 1-219.

Lindsaya lanceolata. Labill.

Lindsaya membranacea. Kunze, *Linnæa*, 18-121.

Schizoloma ensifolia. J. Smith, Moore's Index.

Tropical Asia, Australia, Africa, and African islands.

Natal.—Streamlets in Coast Bush, where it was found by Gueinzus, Cædmore, Kirkly Vale near Umvoti, Attercliffe, Head of Natal Bay (M'Ken), near New Guelderland (Buchanan).

Credited in "Syn. Fil." to Cape Colony, but no locality is known to me.

Genus X.—*ADIANTUM*, Linn.

A very natural group of ferns, having black wiry stems, and delicately herbaceous pinnules, which bear on their tips, or in notches of the outer margin, the reniform or longish sori. Indusium membranaceous, opening inward, and bearing the capsules on its inner surface. Veins free in all our species. This is a large and widely distributed genus, mostly tropical, and almost all the species are favourites in cultivation.

Key to the species :—

§ Frond simple, reniform.

21. *A. reniforme*.

§§ Frond pinnate.

22. *A. caudatum*.

§§§ Frond 2, 3, 4 pinnate.

23. *A. Capillus-Veneris*. Sori across the top of the lobes or pinnules, longish, nearly straight, not sunk, pinnules cuneate.

24. *A. Paradisææ*. See description.

25. *A. thalictroides*. Pinnules shortly cuneate or roundish, small ; sori one to two in each, reniform, in a deep sinus.

26. *A. Cæthopicum*. Pinnules rounded at the base, large ; sori several in each, curved or reniform.

21. *ADIANTUM RENIFORME*. Linn. Var. *ASARIFOLIUM*. Willd.

Plate XV. Fig 1. Natural size.

Crown tufted, stalks, wiry, three to six inches long, shining, nearly black, with a few brown scales at the base. Frond reniform, one and a half to two inches broad, with a deep sinus, and the rounded lobes at the base almost meeting. Frond firm in texture, often plaited, glabrous, except at the top of the stalk, where there are scattered woolly hairs. Frond slightly lobed, each lobe all round the frond except at the base, bearing a sorus one to three lines long, half-line broad, forming a crescent-shaped hollow on the margin. Veins distinct, flabellate from the stem, afterwards forking, three to eight venules going to each lobe.

Mascarene islands. Only known as African by some barren

fronds received from Drakensberg by Rev. J. Buchanan "gathered beside a spring." Kuhn doubtfully gives Senegambia as another African locality.

22. ADIANTUM CAUDATUM. Linn.

Plate XV. Fig. 2. Natural size.

Crown tufted, frond simply pinnate on a short stipe, lanceolate, one inch broad, twelve to eighteen inches long, with the pinnæ toward the base rather reduced in size, and gradually much reduced and more scattered toward the point of the rachis, which generally is prolonged into a leafless tail, producing a bud at its apex, from which a young plant is developed when it reaches the ground. Texture at first very delicate, afterwards firmly herbaceous; colour light green. Stipe and rachis with abundant short soft brown hairs, especially at the base. Pinnæ with a few scattered hairs on both sides, or at the margin only. Pinnæ half-inch long, quarter-inch broad, shortly stalked, or sessile, one-sided, the lower edge entire, arching or straight, at a right angle from the rachis; the point and upper side rounded to where it suddenly drops parallel with the rachis. The upper side is cut halfway down into three to five emarginate or crenate-rounded lobes, which, when fertile, bear the sori in a straight line on their points. Sori not sunk.

South Asia, Tropical Africa, and Mascarene islands, gathered in Transvaal by Mr. Todd, of Inanda, and a plant of it, recently found near Barberton, is growing in Mr. John Wood's garden at Grahamstown.

Cape Colony is credited with it in "Syn. Fil.," but I have heard of no locality there.

A. ROTUNDATUM, Kze., described from a specimen in Maire's Herbarium labelled "*Promentorum Bon Spei*," seems to be a large glabrous form of *A. caudatum*, paleaceous only at the base of the stipe, and with reniform sori. It differs in texture and colour from *A. lunulatum*, as well as in the shape of the sori.

This is

A. rotundatum. Kze. *Linnaea*, 10: 528; Pappe and Rawson, 52; Hk. *Sp. Fil.* II. 53.

A. rhizophorum. Swartz, *Syn.*; Kuhn *Fil. Afr.* 66.

A. caudatum. Var. *b. rhizophorum*. Hk. and Bkr. *Syn. Fil.* 115.

A. Edgeworthii. Hk. *Sp.* 2-14; Hk. and Bkr. *Syn. Fil.* 472.

Lady Barkly, in a postscript to her revised list, writes :—"We have received through Dr. Shaw, from Wakkerstroom, Transvaal, an *Adiantum*, which seems to be a connecting link between *A. caudatum* and *A. lunulatum*;" no doubt the same thing.

(*A. LUNULATUM*, Burm., which occurs in Zambesia, resembles *A. caudatum* in habit, but has stalked pinnæ two to three times as large, deep green, less cut, of thinner, more papyraceous texture, with continuous marginal sori, and the whole plant is glabrous.)

(*A. OATESII*, Bkr. (in Oates Matebeleland plate K), was gathered by the late Mr. Frank Oates in Matebeleland during his journey from Durban to Victoria Falls, Zambesia, but most likely within the tropics. The frond is divided in a sub-palmate manner into several pinnate pinnæ four to six inches long, each bearing numerous lobed and one-sided pinnules like those of *A. caudatum* but larger. Whole plant is glabrous, and of thin texture.)

23. *ADIANTUM CAPILLUS-VENERIS*. Linn.

Plate XVI. var. *major*. Plate XVII. var. *minor*.

Rhizome creeping on or near the surface of the ground, one to four inches long, one to four lines in diameter, fleshy, set with brown chaffy scales, and producing numerous fronds at short intervals. Fronds two to three pinnate, deltoid, four to eight inches long, three to six inches broad, on a stipe three to eight inches long, which is set below with chaffy scales at first, afterwards glabrous, black, and wiry. Pinnæ deltoid, pinnate, two-pinnate, or occasionally three-pinnate, with fine black hair-like rachis and petioles. Pinnules a-half to three-quarter-inch long, and about as broad, glabrous, cuneate, or tapering down to the petiole, deeply lobed, and when barren toothed at the edge; of light green, delicate, and almost transparent texture. Sori longish

or round, placed across the top of the lobes, and not much sunk into them.

A. Capillus-Veneris. Linn. ; Pappe and Rawson, 32 ; Moore, Ind. 21 ; Kuhn, Fil. Afr. 62 ; Hk. and Bkr. Syn. Fil. 123.

A. capillus. Kunze, Linnæa, 10.

A. Africanum. R. Br. ; Lowe.

A. marginatum. Schr. Gott. Gel. Anz. 1818, 918.

Throughout the tropics and sub-tropics, and throughout Africa ; in moist places by streams.

West.—Rather rare ; Table Mountain (Lady Barkly), Gnadenthal (Breutel).

East.—Near Grahamstown (Holland), Algoa Bay (Forbes), Graaffreinet (Bulus), Bedford, and Kat River.

Kaff.—Komgha (Flanagan), Main, Transkei (Mrs. Young), in every stream near the lower edge of the forest from Thaba N'doda to Kei Road, Stutterheim, Toise River, &c., and often about waterfalls toward the Coast ; not seen above 2500 feet.

Natal.—Common along the Coast ; frequent up to 2000 feet alt., afterwards more rare (Buch.).

Besides the usual form the following varieties occur :—

Var. β . *major*, plate XVI. Pinnules very broad, larger than the ordinary form, deeply lobed, rather rounded below, but tapering a little to the petiole ; most of the pinnules except the terminal ones more or less one-sided.

Var. γ *minor*, plate XVII. Fronds as large as in the type, but pinnules narrower, and more cuneate ; sori longer, often crossing the whole pinnule, and then straight. Frond nearly flat.

The normal form is intermediate between these two varieties, and frequently approaches them. Both the varieties grow in the neighbourhood of King William's Town.

24. *ADIANTUM PARADISEÆ.* Baker.

(Extracted from "Gardener's Chronicle," Nov. 16, 1889, II. 558.)

"General habit of *A. Æthiopicum*, *cuneatum*, and *venustum*. Stipe and rachis slender, naked, glabrous, brown-black. Frond deltoid, tripinnate, glabrous, half-a-foot long and nearly as broad, lower pinnæ largest, deltoid, unequal sided, cut away on the lower side at the base, conspicuously petioled ; ultimate segments

rhomboidal, a quarter to a third of an inch long and broad, cuneate, and entire in the lower half or more, irregularly rounded, and sparingly crenate at the apex. Sori one to three to a segment, oblong, broadly shallowly reniform, one-twelfth to one-sixth of an inch long. Indusium broad, glabrous, persistent. J. G. Baker.

"This new *Adiantum* has been sent to the 'Gardener's Chronicle' by Mr. William Juby, for the last twenty-five years gardener to J. E. Wood, Esq., of Grahamstown. It was found in the mountains in the district of Bedford by Miss Paradise, and is named after that lady at Mr. Juby's request. Of the numerous new forms nearly allied to *A. æthiopicum*, *venustum*, and *cuneatum*, its nearest ally is the Himalayan *A. Wattii*. Bkr. (Journ. Linn. Soc., vol. 18, 381)."

25. *ADIANTUM THALICTROIDES*. Willd. Hb.

Plate XVIII. Fig. 1. Nat. size, fertile. b pinna, barren.

Fig. 2. Variety, natural size, and magnified.

Rhizome very long and slender, subterranean, slightly branching, and set with grey or afterwards nearly black, lanceolate scales. Frond three-pinnate, ovate-deltoid, thinly herbaceous, light green, but not glaucous, six to nine inches long, three to five inches broad, with four to five pairs of alternate, rather distant, pinnæ, which are compactly deltoid, two-pinnate, or occasionally three-pinnate. Pinnules small, shortly stalked, widely cuneate, one to three lines broad and long, broadest at the top; entire or two lobed, each lobe bearing a crescent-shaped sorus sunk into a deep hollow. When not fertile the pinnules are larger, more rounded below, and finely serrated round the outer edge. Stipe three inches long, at first thickly set with chaffy scales, afterwards like the rachis and petioles, chestnut brown and shining, but very herbaceous in texture, and fragile.

On the pinnæ the rachis is almost hid from below by the overlapping first pinnule on the upper side of each ultimate pinna.

A variety differs from the more usual form in having rather larger pinnules, with the sorus quite reniform, and sunk so far into

the lobe that it is quite surrounded by lamina, while the veins all curve over and terminate in the sorus. (Fig. 2.)

This species is difficult to cultivate satisfactorily, in which respect it differs much from *A. æthiopicum*, which is a great favourite, and always does well.

Some doubt may exist as to whether our plant be Willdenow's *A. thalictroides*, as Schlechtendal's description is not very clear, and his figure was one of those that were not issued owing to the non-completion of the book. Reference to Willdenow's Herbarium is required to certify this. Baker unites *A. thalictroides* with *A. æthiopicum*, but Kuhn keeps them distinct. However there is no doubt but that our plant is a distinct species from the strong growing *A. æthiopicum* of the Eastern forests.

A. thalictroides. Willd. Hb. 20,101 (Schl.), 20,102 (Kuhn); Schl. Adum. 53 (t. 33 ined.); Kze. Linnæa, 10, 530; Pappe and Rawson, App. 52; Kuhn, Fil. Afr. 66.

This is abundant near Cape Town, but almost absent elsewhere.

West.—Table Mountain, Devil's Mountain, &c.; Swellendam (Holland).
East.—Bedford.

26. ADIANTUM ÆTHIOPICUM. Linn.

Plate XIX. Part of frond, natural size.

Rhizome paleaceous, almost crown-like, branched and tufted, a half to two inches long, two lines diameter, but with very long slender running and almost frondless branches. Frond glabrous, three to four pinnate, one to one and a half feet long and broad, on a shining, metallic, black, wiry stipe, often two feet long, and having lanceolate, brown scales at the base only. Pinnæ lax, alternate, arching, spreading, erectopatent; lower pinnæ largest, six to twelve inches long, three to six inches broad, with four to six pairs of secondary pinnæ; the upper simply pinnate; the lower two-pinnate. Pinnules three to six lines broad, three to five lines long, generally wider than long, rounded, lobed, and when barren slightly crenate on the upper side; the lower side, straight or rounded, or more frequently slightly tapering to the petiole,

but often almost reniform. Pinnules set obliquely on the petiole, which is one to two lines long, and like the branches of the rachis black, hair-like, and shining. Sori crescent shaped, several in a pinnule, one in each lobe, one line or less broad, deeply sunk into the frond, or surmounted by a horn of green lamina on each side. Texture thin, colour light green or glaucous green; pinnules very easily broken off in mature fronds, or when dried.

Mr. Wood sends from Natal specimens larger in all parts, and with firmer more coriaceous texture, with pinnules three-quarter to one inch broad, half-inch long, and sori, though sometimes reniform, more frequently elongated, and sunk into the frond. Indusium sometimes quarter-inch long.

A. SULPHUREUM, Kaulf., is exactly like ordinary *A. æthiopicum*, but dusted all over the under side of the pinnules with yellow powder. The crown and young unfolding fronds are also more or less yellow with this waxy powder. Mr. Wood states it is not uncommon near Harrismith, Orange Free State, but previously it had only been known as South American.

A. ÆTHIOPICUM is the finest and most easily cultivated of our *Adiantums*, but is not common in cultivation.

A. æthiopicum. Linn. Sp.; Schl. Adum. 53; Thunb. prod. 173; Thunb. Fl. Cap. 736; Kunze, Linnæa, 10, 529; Pappe and Rawson, 33 (?); Hk. and Bkr. Syn. Fil. 123, in part; Kuhn, Fil. Afr. 62.

Owing to *A. thalictroides* having been formerly included in *A. æthiopicum*, the separate distribution of this is rather uncertain, but I have seen no specimens from the western province, though Kuhn places here Browning's Nos. 121, 122, Novara Expedition, Simon's Bay.

East.—Bedford Forest (Miss Cook), Grahamstown, near Reservoir (Holland, 1866); Boschberg (MacOwan); Oudeberg, Graafrinet, 4800 feet (Bolus).

Kaff.—Perie Mission Station, Poutz' Bush, Keiskama Hock, Toise River, all above 2000 feet.

Natal.—Common from Maritzburg to Drakensberg (M'Ken); Karkloof, Umpumulo, rare (Buch.).

Genus XI.—LONCHITIS. Linn.

A genus consisting of two species, closely allied to *Pteris*, and only distinguished by having the sori confined to the sinuses; while from *Hypolepis* and *Cheilanthes*, it is distinguished by the anastomosing venation.

27. LONCHITIS PUBESCENS. Willd.

Plate XX. Lower pinna of nearly barren frond, natural size.

Plate XXI. Part of fertile frond, natural size.

Root stock suberect or procumbent, densely clothed with brown shining woolly tomentum, or shag. Roots very strong, wiry. Fronds three to four feet long, two to three feet broad, two to three pinnatifid, thinly herbaceous in texture, and having a stout hairy stipe two to three feet long, and paleaceous at the base.

Frond very various in cutting, but generally with the upper pinnæ more or less connected by a wing along the side of the rachis. This wing increases in breadth upward, and often disappears in the lower half of the frond, where the pinnæ are shortly stalked, or sessile, or more or less connected with the rachis above them. Pinnæ lanceolate from a wide base, the lower twelve to eighteen inches long, two to six inches broad, cut nearly, but not quite to the rachis, into ovate-deltoid segments, which when nearly barren are entire, with the sori between the upper pinnules; but when abundantly fertile cut halfway to the mid-rib into rounded lobes, and bearing sori at the bottom of the sinus between each of these lobes. Involucre crescent shaped or reniform between the lobes, but occasionally more or less elongated between the pinnules. Veins uniting into numerous irregular areolæ, but with a line of larger and more elongated areolæ along each mid-rib. Whole frond finely villose, especially on the rachis, mid-rib, and veins of the under-surface. Exceedingly variable in cutting, and in the amount of hairs on the frond; and one form formerly held as a species under the name of *L. glabra*, Bory, is still mentioned as a variety in "*Syn. Fil.*," but the specimens I have seen do not seem to have characters for two forms, and Sanderson's specimens in *Herb. Gub.* named *L. glabra* are as hairy as others.

Kuhn gives three species, viz. :—

1. *Pteris glabra*. Cape, Natal, and Bourbon.
2. *Pteris natalensis*. Kuhn. = *L. natalensis*, P. and R. Natal, and Johanna Island.
3. *Pteris pubescens*. Kuhn. = *L. pubescens*. Willd. = *L. hirsuta*. Bory. Mascarene Islands only.

Schlechtendal's otherwise good figure shows sori without indusia, though the indusium is described in the text.

Lonchitis pubescens. Willd ; Hk. Sp. Fil. II. 56 ; Hk. and Bkr. Syn. Fil. 128 ; Wood's Natal Ferns, 9.

Lonchitis natalensis. Hk. Sp. Fil. 2, 57, t. 89 b ; Pappe and Rawson, 38.

Lonchitis glabra. Bory. Schl. Adum. 47, t. 27 ; Kunze, Linnæa, 10, 528 ; Kunze, Suppl. to Schk., t. 66 ; Pappe and Rawson, 38 ; Hk. Sp. Fil. 2, 57.

Pteris. Kuhn as above.

Africa, African Islands, and South America ; growing with us in Bush, Coast, or Midland districts.

West.—Knysna (Lady Barkly), George (Holland) (Burchell, 5814).

East.—Tzitzikamma. P. and R.

Kaff.—No locality known. Pondoland (Drège).

Natal.—Kranzkloof, Inanda, Umbilo, Field's Hill, Great Noodsberg (M'Ken), Umpumulo (Buchanan).

Genus XII.—HYPOLEPIS. Bernh.

Sori small, round, equal, situated in the sinus between two lobes, or where a sinus might be expected if further divided. Indusium membranaceous, covering the capsules. Veins free. A small genus closely allied to *Cheilanthes*, and formerly included in it. The sori are placed at the base of the sinus, and terminate a side veinlet ; while in *Cheilanthes* they terminate the principal veinlet, *i.e.* the one leading into a lobe. Most of the species belong to the southern tropics, and a few extend to New Zealand, and South Africa.

28. HYPOLEPIS ANTHRISCIFOLIA. Presl.

Plate XXII. Part of frond, nat. size. b Pinnule, enlarged.

Rhizome two to four yards long, half-inch diameter, subterranean, branching occasionally, clothed with brown scales, and sending up at intervals of about a foot erecto patent, deltoid

fronds, two to five feet broad, three to eight feet long, on a stout stipe two to three feet long, which is more or less rough with raised points, or when young set with abundant long spreading white hairs below. The fronds, which die down to the ground in winter, develop at first as three almost equal and diverging branches, but when the central one is fully developed, the frond is three to four pinnate in the usual way, with the two first side branches as opposite deltoid lower pinnæ, two feet long, and one to two feet broad. Pinnæ distant, and like the secondary pinnæ, pinnules, and lobes, all opposite or nearly so. Ultimate pinnæ one to two inches long, three-quarter-inch broad, ovate-lanceolate, and bearing six to ten pairs of sessile ovate pinnules, which are cut nearly to the rachis into toothed segments bearing a sorus in the bottom of each sinus. Frond thinly herbaceous, when young bristling with longish spreading jointed glandular hairs on both surfaces, especially on the veins and rachis; but these fall off the stipe and rachis as the frond matures, leaving rough raised points, while on the veins they become less noticeable. This may account for *H. aspera*, Presl., mentioned in "Syn. Fil.," and by Lady Barkly as a form, though Mr. Marquardt does have in cultivation a smaller and more rigid form found on Table Mountain. In several Herbaria much cut barren fronds of *Hemitelia capensis* from young plants are marked *H. anthriscifolia*, Pr., var. *aspera*. Some Natal specimens in Herb. Gub. are almost glabrous.

Hypolepis anthriscifolia. Presl.; Pappe and Rawson, 37; Hk. Sp. 2, 66, tab. 95A; Wood's Natal Ferns, 10; Hk. and Bkr. Syn. Fil. 129.

Cheilanthes anthriscifolia. Schl. Adum. 52 (tab. 32, ined.).

Dicksonia anthriscifolia. Kze. Linn. 10, 545 (?).

Hypolepis sparsisora. Kuhn, Fil. Afr. 120.

Cheilanthes sparsisora. Schrad. Gött. Anz. 1818, 918; Kze. Linn. 10, 542; Schl. Adum. 52.

Hypolepis eckloniana. Fée.

Hypolepis aspera. Presl.; Pappe and Rawson, 38.

Cheilanthes aspera. Kaulf. Linnæa, 6, 186; Kze. Linnæa, 10, 544.

Cheilanthes commutata. Kze. Linnæa, vol. 10, 542.

Hypolepis elata, Presl., is also stated ("Syn. Fil.," 129) to belong here, though Lady Barkly states that *Ch. elata*, Kze., No.

97 of Rawson Herb., is *H. Bergiana*, and Kuhn gives the name as a synonym of that species.

In general appearance it is not unlike the common Bracken, but grows in dense masses, in wet sunny glades in the forest.

South Africa, and Mascarene islands.

West.—Plettenberg's Bay (P. and R.), Kaatjes Kraal, Knysna (Burchell, 5277), Table Mountain (Mr. Marquardt), Devil's Mountain (Guthrie), Grenadendal, George, &c. (P. and R.).

East.—Somerset East (Guthrie), Grahamstown (Holland), Boschberg (MacOwan), Zuurberg, &c.

Kaff.—Perie Forest, Mount Kemp, Frankfort, &c.

Natal.—Great Noodsberg, Inanda, Field's Hill, Maritzburg, and Swartkop (M'Ken), Umbilo Falls, Umpumulo (Buchanan), Midlands (Wood).

29. *HYPOLEPIS BERGIANA*. Hk.

Plate XXIII. Nat. size. b Pinnule.

Crown tufted, set with lanceolate brown scales. Frond triangular, three-pinnate or four-pinnatifid, herbaceous, four to eighteen inches long and broad, on a rusty brown stipe four to twelve inches in length, which is paleaceous at the base only, but thickly set throughout with very short spreading or recurved glandular jointed hairs. Rachis and mid-ribs tomentose with similar hairs, and both surfaces of the frond are villose with short white glandular hairs. Lower pinnæ much largest, deltoid; secondary pinnæ on the lower side larger than those on the upper side, and the same is the case with the pinnules. Pinnules ovate, a quarter to three-quarter-inch long, cut to or near to the mid-rib into oblong, obtuse, entire, or lobed segments, bearing rounded sori along each side. The indusium is thin and membranaceous, and the sori are sometimes placed along the edges of the pinnules as in *Cheilanthes*, in which genus it was placed by Pappe and Rawson; but in *Cheilanthes* they are most abundant toward the points of the lobes and pinnules, while here they are most regular in or near the sinus, or where a sinus might be expected if the frond were further divided.

This plant has no rhizome, and therefore seems out of place in

section *Eu-hypolepis*, characterised by wide-creeping rhizome, in which it is included in "*Syn. Fil.*;" but frequently in cultivation young plants spring up from adventitious buds on the roots, especially where the roots come to the surface at the edge of a pot.

Hypolepis bergiana. Hk. Sp. 2, 67; Hk. and Bkr. *Syn. Fil.* 130.

Cheilanthes bergiana. Schl. Adum. 51 (tab. 31 ined.); Kunze, *Linnæa*, 10, 541; Pappe and Rawson, 34; Kuhn, *Fil. Afr.* 69.

Cheilanthes elata. Kze. *Linn.* 10, 542.

Hypolepis elata. Presl. Hk. Sp. *Fil.* 2, 67.

} See synonyms of

H. anthriscifolia.

Found only in South Africa, north to Zambesia; growing in moist but not wet places in the forest.

West.—Swellendam, George (P. and R.), Koratra (Drège), Knysna (Burchell, 5218 and 5417).

East.—Kat River (Holland), Bedford (Miss Cook), Uitenhage, &c.

Kaff.—Abundant all along the forest, and in bush at Peddie, Toise River, Dohne, &c.; also Komgha (Flanagan), and in Transkei at Bazija (Baur.), and Main (Mrs. Young).

Natal.—Buckingham, Esidumbeni, Kruisfontein, Maritzburg (M'Ken) 2000 to 3000 feet, Umpumulo (Buchanan).

Genus XIII.—CHEILANTHES. Sw.

Small herbaceous or subcoriaceous ferns, having small round marginal sori on the points of the lobes, or crowded all round the edge of the frond, except at the sinuses. The sori are terminal on the veins, and at first quite separate, though afterwards more or less confluent; but the indusia are roundish and separate. This distinguishes them from *Pellæa*, but some species bear fronds showing the characters of both genera on the same plant. From *Nothochlæna* they are more difficult to distinguish, as the indusium is formed of the reflexed margin of the frond, often hardly changed in texture, and sometimes only partly reflexed; while in *Nothochlæna*, which corresponds in habit, the sori are without indusia, though the margin is sometimes more or less reflexed. The separation of the ferns into indusiate and non-indusiate, is here, as in several other cases, felt to be a purely artificial arrangement, as any natural arrangement would unite these two genera, or bring them into juxtaposition. The *Cheilanthes* are widely

distributed, and most of the species vary considerably in accordance with surroundings.

Synopsis of the species.

30. *C. pteroides*. Frond deltoid, three-pinnate, glabrous, pinnules stalked, half-inch long, oval, entire; involucre distinct, one to each veinlet.
31. *C. capensis*. Frond deltoid, two-pinnatifid, glabrous, pinnules half-inch to one inch long, sessile, decurrent, lobed; involucre numerous, many to a lobe.
32. *C. depauperata*. Frond lanceolate, two-pinnate, four to twelve inches long, a quarter to half-inch broad, glabrous above; pinnæ deltoid, lobes linear, tomentose on the under surface.
33. *C. hirta*. Frond broadly lanceolate, three-pinnatifid, hairy; pinnæ ovate-lanceolate; lower pinnæ reduced; frond and segments plain.
— *Var. contracta*. Frond narrowly lanceolate, three-pinnatifid, hairy; frond and segments much infolded.
34. *C. parviloba*. Frond lanceolate, three-pinnatifid; pinnæ lanceolate, glabrous; stipe hairy; pinnules deltoid.
35. *C. multifida*. Frond deltoid, three to four pinnatifid, glabrous; segments nearly flat, slightly involved, with two to four membranous indusia to each lobe.
36. *C. induta*. Frond ovate-lanceolate, three-pinnatifid, glabrous above; segments hairy and tomentose on the under surface, involved, and with no distinct indusia.
37. *C. Bolusii*. Frond deltoid, four-pinnatifid, glabrous above, segments very small, much involved, glandular on the under surface.

30. *CHEILANTHES PTEROIDES*. Sw. The Myrtle Fern.

Plate XXIV. Natural size.

Crown procumbent, paleaceous. Frond coriaceous, three-pinnate, triangular, nine to fifteen inches broad, twelve to eighteen inches long, on a naked shining nearly black stipe nine to twelve inches long. Lower pinnæ largest, deltoid, simply pinnate toward the point, two-pinnate below. Other pinnæ mostly simply pinnate, and decreasing to the simply pinnate point of the frond. Pinnules shortly stalked, glabrous, oblong, rounded or cordate at the base, rounded at the apex, a half to three-quarter-inch long, two to five lines broad, crenate. Rachis shining, but woolly at the axils, or at first all along. Sori small, roundish, or crescent-

shaped, on notches in the margin, closely placed all round the pinnule, but distinct.

Cheilanthes pteroides. Swartz Syn. 128; Schl. Adum. 48; Kunze, *Linnæa*, 10, 536, 23, 245; Pappe and Rawson, 33; Kuhn, *Fil. Afr.* 74; Hk. and Bkr. Syn. Fil. 131.

Adiantum pteroides. Linn. Sp. 7942; Thunb. Prod. 173; Thunb. Fl. Cap. 736.

Adiantopsis. Fée.

South Africa, Mombasa, and Java.

In damp shady places among rocks near Cape Town, The Paarl, Table Mountain, Tulbagh, &c. Swellendam (Holland). A decidedly western fern, but recorded by Lady Barkly from Orange Free State, and said by Kuhn to have been found in Natal by Gueinzus, though not found there since. Not known in eastern district or Kaff.

31. CHEILANTHES CAPENSIS. Swartz.

Plate XXV. Fig. 1. Natural size.

Crown tufted, procumbent, densely paleaceous, with long rusty scales; frond herbaceous, glabrous, two-pinnatifid, ovate or triangular, one to four inches broad, two to four inches long, on a dark brown polished stipe two to four inches long, and slightly scaly at the base. Pinnæ opposite, obtuse, deltoid, sessile, or shortly stalked, cut to or near to the mid-rib into two to five pairs of entire or lobed rounded oblique, more or less alternate and decurrent pinnules, which are serrate when barren, and not reflexed when fertile. Sometimes the lower pinnæ are again pinnate. Rachis shining black, round, or in the pinnæ more or less winged. Sori small, closely set all round the pinnules, but distinct. Involucre membranaceous, ciliated.

Kunze makes two varieties, viz. :—

α. dentatum. Frond subcoriaceous, stipe and rachis firm, pinnules and segment dentate, indusia sub-contiguous.

β. crenatum. Frond membranaceous, stipe and rachis slender, pinnules and segments sinuato-crenate, sub-emarginate, indusia remote.

Var. *crenatum* is the ordinary form. Var. *dentatum* is Burchell's 5602 and 1015.

Cheilanthes Capensis. Swartz. Syn. 128; Schl. Adum. 48, tab. 28; Pappe and Rawson, 33; Kuhn, Fil. Afr. 70; Hk. and Bkr. Syn. Fil. 132 (not *C. Capensis*, Ecklon).

Adiantum Capense. Thunb. prod. 173; Thunb. Fl. Cap. 736; Swartz, Schrad. Jour. 1800, II. 85; Kze. Linnæa, 10, 530.

Hypolepis Capensis. Hk. Sp. Fil. 2, 71, t. 77 c.

South Africa only; growing in shady localities in the southern district, but rare in Kaff. and Natal.

West.—Common near Cape Town, Goukamma, near Knysna (Burchell, 5602), Tulbagh Kloof (Burchell, 1015), also Swellendam (Holland), Rondebosch (Bergins), Clan William and Stellenbosch (Ecklon), Namaqualand, and Ruigtevallei (Drège).

East.—Algoa Bay (Forbes), Van Staadens River (Browning), Graaffreinet (Bolus), Boschberg (MacOwan).

Kaff.—Chumie Forest, Alice (Mrs. Young).

Natal.—Eland's Kop, Mooi River, 5000 feet alt. (Buch.).

Transvaal.—(Lady Barkly).

32. *CHEILANTHES DEPAUPERATA*. Baker. (In "Annals of Botany," Vol. V., No. XVIII.)

Plate XXVI. Fig. 1. Natural size. b Pinna, when dry. c Pinna, enlarged. d Pinna of wider form, natural size.

Rhizome shortly running, with tufted crown, set with numerous brown scales. Stipe wiry, glabrous below, slightly viscose above, four inches long. Frond two-pinnate, six to eight inches long, half to three-quarter inch broad, with twenty to twenty-five deltoid or three to five foliate pinnæ, sessile above, stalked below. Pinnules linear, one to two lines long, half-line broad, with the edges inturned in lobes of same texture, without separate involucre, and the underside densely set with rufous tomentum, with a few scattered whitish hairs mixed. Upper surface nearly glabrous. Pinnules when dry all very much recurved downward like birds' claws; when fresh they are flat. General aspect is like one elongated pinna of *C. parviloba*, but tomentose below, and as in it, the pinnules drop off, leaving the short petioles dry.

In Herb. Gub. a specimen in the Barkly collection from Hex River and one from Namaqualand (Herb. MacOwan) belong to

this species. Baker gives as locality "Central Karroo region (Sir H. Barkly, Bolus)," and places it after No. 15 in "Syn. Fil.," p. 134.

Another specimen (named *C. hirta-parviloba*, smaller sp. only) which I cannot distinguish from this, has alternate pinnæ one inch apart, one inch long, quarter-inch broad, and with six to nine pairs of linear-lobed pinnules, half-line or less broad, one to two lines long, all coated underneath with rusty scales and tomentum.

C. hirta, var. *cornuta*, of the Herb. Gub., which seems to be Pappe and Rawson's *C. cornuta*, Kze., must also be referred here, though approaching more nearly the ordinary compact form of *C. hirta*, to which this species as a whole stands in much the same relation as does *C. parviloba*; only that this is densely tomentose below. Baker includes *C. cornuta*, Kze., in *Pellæa involuta*, Bkr., except Ecklon's plant described by Mettenius (Cheil., No. 33), the identity of which he doubts. Pappe and Rawson's description would not exclude the present species, but Kunze remarks:—"Species not to be compared with any, unless with the small contracted form of *Pellæa hastata*, but the rigidity of the fronds, sub-linear form, and spreading sori, easily distinguish it."

This refers rather to *C. involuta*, and I have therefore taken Baker's name for the present species. Baker describes the frond as four to six inches long, quarter to one-third of an inch broad with stipe three to four inches long, and omits mention of the tomentum, but, as shown above, more specimens are yet required to show the limits of the species.

33 CHEILANTHES HIRTA. Swartz.

Plate XXVII. Nat. size. b Fertile pinnule, enlarged. c Section of same.
d Glandular hairs from rachis.

Crown procumbent, with abundant rusty brown lanceolate scales. Frond three-pinnatifid, lanceolate, six to eighteen inches long, one to four inches broad, on a dark brown stipe three to six inches long, more or less scaly at the base, and like the rachis and veins, thickly set with soft spreading, jointed, glandular white hairs, which in old fronds become rusty. Pinnæ opposite below,

alternate above, plain (*i.e.* not revolute), one to two inches long, half to three-quarter inch broad ; lower pinnæ more distant, and more or less reduced in size ; all ovate or ovate-lanceolate, shortly stalked, and having about six pairs of nearly opposite, widely ovate, flat pinnules, rounded at the apex, cut halfway or more into about three pairs of rounded or slightly lobed segments. Sori three to ten to a segment, almost contiguous, but distinct, one to each veinlet, and having only one to three capsules in each, which are half covered by the rounded involucre formed of the reflexed and slightly crenate margin of the frond, hardly altered in texture. Frond abundantly set with white glandular hairs, especially on the upper surface, and the involucre is fringed with similar hairs, Texture softly herbaceous in shade, more or less coriaceous when exposed, but unless very dry, frond and pinnules are always alike spread out, or recurved only at the extreme edge.

Cheilanthes hirta. Swartz ; Schl. Adum. 50, tab. 30 ; Kze. Linnæa, 10, 539, 23, 244 ; Pappe and Rawson, 35 ; Kuhn, Fil. Afr. 72 ; Ilk. and Bkr. Syn. Fil. 136.

C. hirta. Sw. Var. *laxa.* Kze. Linnæa, 10, 539 ; Kuhn, Fil. Afr. 72.

C. olivacea. Fée.

C. hirta. Sw. Var. *olivacea.* Kaff. Ferns, 27.

Adiantum caffrorum. Sw. Schrad. Jour. 1800, II. 85 (non Linn., Thunb., &c.).

Nothochlæna capensis. Sprengel, Syst. Veg. Suppl. 32.

Cheilanthes glandulosa. Pappe and Rawson (possibly a form of *C. parviloba*).

Cheilanthes refracta, P. and R., 95, founded on a Griqualand sp., is also given as a synonym here by Lady Barkly, but according to their description must be something different. Throughout South Africa, extending to the Mascerenes. In Cape Colony one of the most frequent and widely distributed ferns, growing mostly in the bush or under stones in kloofs, from the coast to near the top of the mountains. In Natal also common, and I have seen specimens from Orange Free State, Transvaal, and Bechuanaland. M'Lea's No. 47 (Bulus 17) from Pilgrim's Rest, Transvaal, is three feet long, nine inches broad, much

divided, quite expanded, and not differing from the common form, except in size, and in being less hairy.

Var. β . CONTRACTA. Kze.

Plate XXVIII. Fig. 1. Nat. size. b Part of pinnule, magnified.

Fronde more rigid and coriaceous, one to two inches broad, six to fifteen inches long, on a stipe three to six inches long, set with a tuft of long linear brown scales at the base. Pinnæ cut as in typical *C. hirta*, but short, dense, curved upward, and with the pinnules crowded and erecto-patent, or upturned on each side of the rachis, and with the lobes and segments more or less curved backward, and having the margin much infolded. Stipe, rachis, and lamina very hairy, and with the involucre ciliated.

C. hirta. Sw. Var. *contracta*, Kze. *Linnæa*, 10,539; Pappe and Rawson, 35.

C. contracta. Mett. MSS.; Kuhn, *Fil. Afr.* 70.

This is as common as *C. hirta*, and takes its place on hard rocky exposed ground. The extremes look distinct, but another form, var. *intermedia*, Kze. (*Myriopteris intermedia*, Fée), has the long narrow compact fronds of *contracta*, together with the plain or only slightly reflexed pinnules of *hirta*; and every intermediate stage occurs between that and both the others.

Var. *contracta* extends as far north as Kuruman, Bechuana-land, and is one of the few ferns of the Karroo and Namaqualand.

34 CHEILANTHES PARVILOBA. Sw.

Plate XXIX. Large frond. Nat. size. b. Part of pinnule, enlarged.
c capsule. Plate XXVIII. Fig. 2. Nat. size. b Pinnule, enlarged.

Crown procumbent, or with a simple or tufted rhizome two to three inches long, set with brown scales. Frond three-pinnatifid, six to eighteen inches long, one to five inches broad, lanceolate, with pinnæ considerably reduced below, or sometimes ovate-lanceolate pointed, with the lower pinnæ not much reduced. Pinnæ twelve to twenty pairs, opposite below, alternate above, three-quarters to three inches long, one-half to three-quarter inch broad, linear lanceolate acuminate, with six to ten pairs of alternate

shining green glabrous pinnules, which are triangular, half-inch or less long, and as much broad at the base ; cut to the mid-rib into one to two pairs of ovate-toothed segments lying parallel to the rachis ; above these the pinnule is contracted into an ovate-oblong lobe, two lines long, one line broad, rounded at the apex, and with five to seven teeth on each side, each tooth slightly hooded at the point, the hood forming the indusium, unchanged in texture, not fringed with hairs, and not nearly covering the one or occasionally two capsules which go to a sorus. Stipe three to six inches long, scaly at the very base only, but set throughout, as well as the rigid rachis and mid-rib, with hairs like those of *C. hirta*, but harder, more bristly, more adpressed, and seldom glandular. Both surfaces of the lamina are destitute of hairs, but have sessile glands, hardly visible until magnified, but so viscid as to make specimens adhere to the paper in which they are dried. When mature the pinnules fall off, and several years' leafless rachises are often on the plant. When dry the whole of the pinnules are reflexed, infolded backward, and bead-like, and the appearance is much changed. The fig. of a magnified pinnule in "Handbook of Kaffrarian Ferns" (Plate XIV., b), drawn from a frond in that condition, makes the reflexed lobes look like numerous rounded indusia, and is therefore misleading. This species was formerly placed as a variety of *C. hirta*, and is still so placed in "Syn. Fil.;" but is much more distinct than other ferns held as species there. It might as well be in *Nothochlæna* as here ; but *C. hirta* is more decidedly a *Cheilanthes*.

Cheilanthes parviloba. Swartz, 128.

Adiantum parvilobum. Sw. Schrad. Jour. 1800, II., 85.

Cheilanthes hirta. Sw. var. *parviloba*, Kze. Linnæa, 10, 539 ; Pappe and Rawson, 35 ; Moore's Index, 243 ; Kuhn, Fil. Afr. 72 : Hk. and Bkr. Syn. Fil. 136.

Growing in dense masses on rocky exposed ground, or under stones in open situations.

West.—Tulbagh (E. and Z), Olifant's River (Mund.), Laange Kloof (Holland).

East.—Uitenhage (Atherstone), Fish River.

Kaff.—Between King William's Town and Peddie in several rocky places, and on similar ground elsewhere, but not common.

Natal.—Upland Bush (Buchanan).

35. CHEILANTHES MULTIFIDA. Sw.

Plate XXX. Nat. size. Plate XXXI. Fig. 3. Pinnule, enlarged.

Crown procumbent, tufted. Frond deltoid or oblong deltoid, three to four-pinnatifid, usually five to eight inches long, and three inches broad, but occasionally twelve to fifteen inches long, and six inches broad, glabrous, and shining on both surfaces, firmly herbaceous, dark green above, lighter below. Stipe as long as the frond, paleaceous at the base, slightly hairy at first, and afterwards like the rachis black, shining, wiry, and glabrous; and flattened or channelled down the front. Pinnæ deltoid, spreading, flat, opposite below, alternate above; pinnules rather longer on the lower than on the upper side of the pinnæ, cut to or near to the mid-rib into oblique ovate, three to five lobed segments, each lobe much revolute at the point, but bearing a distinct white membranous rounded indusium besides. The fertile pinnules have the margin much reflexed, and often more or less bead-like, but the barren frond is plain.

Cheilanthes multifida. Swartz; Schl. Adum. 49, tab. 29; Kunze, Linnæa, 10, 537; Pappe and Rawson, 33; Kuhn, Fil. Afr. 73; Hk. and Bkr. Syn. Fil. 138.

Adiantum multifidum. Schr. Jour. 1800, II. 85.

Lonchitis cafferorum. Sw. Schr. Jour. 1800, II. 292.

Cheilanthes capensis. Ecklon, un. it. 168 (Kuhn), not *C. capensis*, Sw.

Almost confined to tropical and sub-tropical South Africa, and growing in rocky places under small scrub, at 1000 to 4000 feet alt., and not uncommon all over the district.

West.—Table Mountain, Meering's Poort (Lady Barkly), Tulbagh, Zwarteberg, Caledon, Swellendam, Clan William, Dutoitskloof, &c.

East.—Amos Kloof, Grahamstown (Holland), Graaffreinet, and Oudeberg (Bulus), Somerset East (MacOwan), Winterberg.

Kaff.—Katberg, Stormberg (Eck.), S.W. of King William's Town, Frankfort Hill, Perie, &c., and in Transkei at Main (Mrs. Young), and Intwanazana (Baur.).

Natal.—Inanda, Inchanga, Cathkin, Unsusi Falls (M'Ken), Field's Hill, Noodsberg, Umpumulo (Buch.).

36 CHEILANTHES INDUTA. Kze.

Plate XXXI. Fig. 1. Nat. size. b Pinnule, magnified.

Rhizome creeping; frond three-pinnatifid, bluntly ovate-lanceolate, four to six inches long, tapering from a base one and a half to two inches broad, and with a stout stipe of several inches, which is slightly paleaceous when young, and afterwards shining brown, or nearly black, and naked; lower pinnæ shortly stalked, one inch long, and hardly so broad at the base, deltoid, and having about six pairs of oblong pinnules, cut to the mid-rib into about four pairs of sessile ovate-lobed segments, which are coriaceous, much revolute when fertile, glabrous on the upper surface, but on the underside set with short thin reddish tomentum, scattered among which are a few long white woolly scales. The upper part of the rachis and its branches is also tomentose, and has scattered scales or hairs. The segments are small, half-globular, bead-like, and having the indusium formed of the inflexed margin, and turned in all round the segment.

Very like *C. multifida* in general appearance, but characterised by the woolly under-surface of the frond, as well as by the indusium. Lady Barkly and Wood give the running rhizome as its distinguishing character, but in *C. multifida* the crown is always more or less procumbent, and often extended into a rhizome. The plant mentioned by Wood as gathered near Newcastle, Natal, by Buchanan, and believed by him to be *C. induta*, differs from the typical *multifida* only in being glandular, or very slightly tomentose on the under surface, but has no scales, and has the involucre white and membranous, in addition to the inrolled edge. From *C. Bolusii* that plant differs in the outline of the frond, as well as in having the lamina more expanded: and it can only be referred to *C. multifida*, Sw., var. *β. flexa*, Kze.

Cheilanthes induta. Kze. Linn. 10,538; Pappe and Rawson, 36; Moore's Index, 244; Kuhn, Fil. Afr. 73; Hk. and Bkr. Syn. Fil. 138. *Myriopteris*. Fée.

South Africa only ; growing in rocky and shady places in the Sneeuwbergen (Drège) Springbok, and Bowesdorp, Namaqualand (Sir H. Barkly).

37. *CHEILANTHES BOLUSII*. Baker.

Plate XXV. Fig. 2. Nat. size. 2 b Pinnule, magnified.

Rhizome shortly creeping, with lanceolate brown scales, keeled, black. Stipe and rachis stout, black, and shining, with a few lanceolate rusty brown scales at the very base. Frond deltoid, three to six inches long, two to three inches broad, on a stipe four to eight inches long ; pinnæ alternate, rather distant, widely deltoid, erecto-patent, ascending, with the pinnules longer and more divided on the lower than on the upper side. Pinnules oblong, with three to six pairs of small, oblique, very much recurved, almost globular, bead-like segments, which are glabrous above, and somewhat glandular below, but have all the upper and side edges so much turned back, hoodlike, that little of the under surface can be seen. No separate indusium can be detected: the reflexed edge being coriaceous like the rest of the frond.

Mr. Baker places it in section *Physapteris* with the remark "near *C. induta* but 4-pinnatifid, with a black rachis and stipe, and small round bullate segments." He also connects it with the Australian *C. Sieberi*, and the Indian *C. bullata*,

It is closely connected with *C. induta*, and *C. multifida*, but distinguished from the former by having no tomentum or scales on the underside of the frond, and from the latter by the segments being further apart, more decurrent, smaller, and much more recurved.

Fig. 1636 Icon. Plant. shows a more expanded frond, with the pinnules largest on the upper side of the pinnæ, though the description puts it the other way. My figure is from part of the type returned from Kew Herb. to Mr. Bolus after the loss of the remainder of his specimens in the wreck of the "Windsor Castle." West—By the Breede River at Darling Bridge. 1873, Bolus (Herb. 2801), found also by L. Kitching (Icon. Plant), Burchell's

5095 from Keureboom River in Long Kloof, must also be referred here, as also another specimen in Herb. Gub. marked *C. induta*, Kze., from the Barkly Coll. without locality.

C. Bolusii, Baker ; Hooker's Icon. Plant, June, 1886. Plate 1636.—
Annals of Botany, 1892, Vol. V., no. 18.

Genus XIV.—*PELLÆA*. Link.

Small ferns of rigid habit, having divided fronds, often coriaceous, lanceolate or triangular, and generally with free veins. Sori marginal, with a rather wide continuous or interrupted indusium, under which the sori are at first separate and terminal on the veins, but afterwards more or less continuous. From *Cheilanthes* this is distinguished by the continuous indusium, though sometimes it is so much interrupted as to make the limit between the two genera rather indefinite. From *Pteris* it is distinguished by the sori being at first confined to the ends of the veins, instead of in a continuous line in the axil of the indusium, but as the capsules mature this character becomes lost, and these two genera then appear almost too closely connected. The species are grouped in "Syn. Fil." into four subgenera, into which our species are placed as under, but the groups are neither natural nor very definite in their limits.

§ *Cheiloplecton*, Fée, including our species 38, 39, 40.

§§ *Allosorus*, Presl., „ „ 41, 42, 43, 44, 45, 46, 47.

§§§ *Platyloma*, Sm., „ „ 48, 49, 50.

§§§§ *Holochlæna*, Bkr., „ „ 51.

The *Pellæas* are widely distributed, but most numerous in Western North America, and in South Africa.

Synopsis of the Species :—

38. *P. auriculata*. Frond lanceolate, simply pinnate or nearly so, herbaceous ; pinnæ ovate ; indusium very broad, crenate.
39. *P. geraniæfolia*. Frond roundish deltoid, 2-pinnatifid, not cut quite to the rachis.
40. *P. deltoidea*. Frond roundish deltoid, 2-pinnate, and cut quite to the rachis, two inches long and broad.

41. *P. robusta*. Frond ovate oblong, two inches long, one inch broad, coriaceous, 3-pinnate; lobes of pinnules not at the base but attached half-way up or more.
42. *P. pectiniformis*. Frond lanceolate, pinnate, rigid, coriaceous, more or less clothed with adpressed woolly scales, pinnules linear.
43. *P. lancifolia*. Frond lanceolate, glabrous, 2-pinnate; pinnules ovate or deltoid, with a narrow base; indusium very broad. Texture herbaceous.
44. *P. consobrina*. Frond 3-to 4-pinnate, deltoid, about as long as broad, more than four inches each way. Stipe and rachis brown.
45. *P. Boivini*
46. *P. Namaquensis*
47. *P. involuta*
48. *P. hastata*
49. *P. leucomelas*
50. *P. calomelanos*. Frond 2-to 3-pinnate, deltoid; stipe, rachis, and petioles, black and shining; pinnules stalked, cordate, or deltoid, glabrous.
51. *P. Burkeana*. Veins anastomosing (the only species in which they are so). Fronds pinnate or 2-pinnate.

}	Frond twice as long as broad, 3-pinnate or 2-pinnate, stem and rachis brown, except in <i>P. leucomelas</i> . A very closely connected group, having no arbitrary characters distinguishing them.
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38. *PELLÆA AURICULATA*. Link.

Plate XXXII. Nat. size.

Crown tufted, paleaceous, with lanceolate rusty brown scales, or sometimes almost without scales. Frond herbaceous, lanceolate, simply pinnate, or sometimes 2-pinnatifid, six to nine inches long, half to one inch broad, with a short brown-black soft naked or slightly scaly stipe, and a polished brown naked green-margined rachis. Pinnæ about eighteen pairs, not regularly opposite, sessile or very shortly stalked, bluntly pointed, ovate or cordate-ovate, or sometimes with one or more lobes at the base, hastate, or cut nearly to the mid-rib; barren pinnæ more rounded than others. Indusium nearly a line wide, similar in texture to the frond. Crenate along its edge and the margin of the frond is also crenate-wrinkled. The crenations on the indusium appear almost like the separate indusia of *Cheilanthes*, but are only vein wrinkles, and not distinct lobes.

This species is very various in cutting, and seems to include both *Adiantum auriculatum*, and *Pteris confluens* of Thunberg,

unless the latter belong to *P. lancifolia* which is nearly related to this; indeed Schlechtendal's fig. d. on Tab. XXIII. approaches *P. lancifolia* closely. The fronds die off during drought, but the ripened crown is capable of standing a long continued drought, even when detached from the roots.

Pellæa auriculata (Link.); Hk. Sp. Fil. 2, 140; Hk. and Gr. Ic. tab. 116; Hk. and Bkr. Syn. Fil. 145.

Cheilanthes auriculata, Link. Hort. Berol. II., 36; Kunze, Linnæa, 10, 531; 23, 242; Kuhn, Fil. Afr. 69.

Pteris auriculata, Swartz. Schrad. Jour. 1800, II., 69; Schl. Adum. 41, tab. 23.

Allosorus auriculatus, Presl., tab. 153; Pappe and Rawson, 31.

Adiantum auriculatum, Thunb., prod. 173; Flor. Cap. 736.

Pteris confluens, Thunb., prod. 173; Thunb., Flor. Cap. 733.

Adiantum hastatum, Thunb., in Hb. Klfs. (fide Kuhn, though Thunberg gives *Adiantum hastatum*, L. as a synonym for his *Pteris hastata* = *Pellæa calomelanos*, Link).

S.W. Africa only, growing on moist shady rotten rocks.

West.—Table and Devil's Mts. and neighbourhood, common; Muisenberg and Clan William (Ecklon); Paarlberg (Drège); Mitchell's Pass and Namaqualand (Sir H. Barkly); Kamiesbergen (Drège).

Stated by Kuhn to have been collected in Natal by Krauss, but not found since. Not known in Eastern Province nor Kaffraria.

39. *PELLÆA GERANIÆFOLIA*. Fée.

Plate XXXIII. Natural size. b. pinnule, enlarged.

Crown tufted, scaly. Frond glabrous on both sides, firmly herbaceous, roundish deltoid, varying from nearly entire to bipinnatifid, but seldom cut quite to the rachis which has always a wide green margin. It varies considerably, and sometimes the barren fronds are small, round, and hardly lobed at all, while the fertile fronds on the same plant are cut nearly to the rachis, and the pinnæ again deeply cut into pointed, lobed, pinnules. The pinnules on the lower side of the lower pinnæ are much longer and more cut than the others. The fronds are one to four inches long and broad, and have a black, shining, wiry, and nearly naked rachis of equal length. The lower pinnæ are nearly as large as

the rest of the frond, thus making it more or less three-lobed. Sori continuous all along the margin, or in some cases very much interrupted, and resembling *Cheilanthes*. Indusium wide, membranaceous. Mid-rib and main veins black and shining; small veins distinctly visible, forked, but not uniting again. This is frequently known as the Oak Fern, but has no connection with the English Oak Fern (*Polypodium dryopteris*), nor with another species (*Polypodium phymatodes*), frequently grown here under the name of Oak Fern. From both these it is easily distinguished by the generic characters of *Pellæa*.

A much cut specimen from Matebeleland in Herb. Gub. has the Cheilanthoid fructification throughout, and is certainly *Cheilanthes Kirkii*, Hk., but specimens from the Colony often have fronds or parts of fronds, so, while on others the indusium is continuous; and it is impossible to maintain the *Cheilanthes* as a distinct plant. *Pteris pedata*, L., which is similar but has the veins uniting again freely, is the *Litobrochia* of Presl with which Pappe and Rawson seem to have confused this, but it is held as a distinct species by Baker, and is not found in S. Africa.

Pellæa geraniæfolia, Fée; Hk. Sp. 2, 132; Hk. and Bkr. Syn. Fil. 146.
Pteris geraniæfolia, Raddi; Kze., Linnæa, 24, 271; Hk. Ic. Plant. tab. 915.

Pteris pedata, Kze., Linnæa, 10, 522; Pappe and Rawson, 25; Ecklon and Zeyher, No. 38; (not *P. pedata*, Linn.)

Pteris Pohlana, Presl; Kuhn, Fil. Afr. 88.

Pteris concolor, Langs and Fisch. Ic. tab. 21.

Cheilanthes Kirkii, Hk. Ic. Fil. II., tab. 81; Hk. and Bkr. Syn. Fil. 132.

Throughout the tropics and a little beyond them; growing on dry banks in bush; not uncommon, but rather local eastwards; not recorded from the west.

East.—Uitenhage (Drège), Bedford (Miss Cook), Amos Kloof, Grahamstown (Dr. Atherstone), Boschberg (MacOwan), Kat River (E. and Z.)

Kaff.—Tamacha (E. and Z.), Komgha (Flanagan), Pondoland (Drège), near Peddie, Dohne, Perie, Mt. Kemp, Frankfort.

Natal.—From the Coast to Maritzburg (Wood); Umpumulo (Buchanan).

Matabeleland.—Mngama's Poort (J. Fry).

Transvaal.—(Herb. Bolus.).

40. PELLÆA DELTOIDEA. Bkr.

Plate XXXIV. Fig. 1. Nat. size. Fig. 2, var. *laxa*, nat. size.

Crown tufted, abundantly set with rusty red scales. Frond widely deltoid, subcoriaceous, glabrous, distinctly bi-pinnate; pinnæ about three pairs, with lobed or pinnatifid pinnules, or the large lower ones on the lower side of the lower pinnæ again pinnate. Frond one to one and a half inches long, one and a half to two inches broad, each lower pinna about as large as the rest of the frond above them, but much larger on the lower side than on the upper. Segments oblique, three lines long, one to two lines broad, bluntly triangular from about halfway down, below which they are narrowed with a curve into a broad base; the triangular part fertile, with a continuous, rather narrow indusium of the same texture as the frond, but having a thinner, scarious lobed margin. Stipe and rachis nearly black, naked, shining; rachis slightly margined. Not unlike *P. geraniæfolia*, but distinctly pinnate throughout.

Pellæa deltoidea. Bkr. Syn. Fil. 146.

Cheilanthes deltoidea. Kze. Linnæa, 10,535; Hk. Sp. II. 106, 147; Pappe and Rawson, 36; Kuhn, Fil. Afr. 70.

Kuhn also gives as a synonym to this species *Pellæa robusta*, Hk., which I have maintained as a separate species.

Little Namaqualand only; growing among fissures of the rocks near Silver Fontein (Drège), and collected since by Rev. Mr. Whitehead, and more recently by Sir H. Barkly.

Cape Colony, Burchell, 2033 ("Syn. Fil.").

Var. *LAXA*, mihi (Plate XXXIV., Fig. 2), much larger than the type; crown tufted, set with red lanceolate scales. Fronds quite deltoid, three inches long and broad, with two pairs of opposite, one-sided, deltoid pinnæ, and a short terminal pinna, and with a naked, shining, brown stipe, three to five inches long. Pinnules similar to those of the type, but larger in all parts, more rounded, and with a distinctly cuneate almost stalked base. Texture thinly herbaceous; indusium narrow. Collected by Mr. Bolus in Namaqualand in 1883. It differs from *C. deltoidea*

mostly in size, and may be a shade grown form. It also resembles *Cheilanthes capensis*, but the indusium is quite continuous.

41. *PELLÆA ROBUSTA*. Hk.

Plate XXXIV. Fig. 3. Nat. size. b pinnule, magnified.

Crown procumbent or shortly creeping, very stout, paleaceous, with rusty scales. Frond ovate oblong, bluntly pointed, glabrous, coriaceous, three-pinnate, one inch broad, two inches long, on a very stout, naked, channelled stipe, an inch long or more, with lanceolate red scales at the very base only. Pinnæ six to eight pairs, close and overlapping; the lower not larger than the upper side; deltoid, with a distinct green rachis, bearing three to four pairs of pinnules, the upper cuneate three-lobed, and the lower divided to the mid-rib into five to seven ovate or three-lobed segments, which are one line long, and not more than a half-line broad when single. Sori mostly confined to the triangular part of the lobes, continuous, comparatively broad, and almost meeting above; same in texture as the frond. Kuhn makes this synonymous with *Pellæa deltoidea*, but Baker maintains both species. Both are found only in Namaqualand, but the specimens I have seen are very distinct from one another and from everything else. Baker mentions its resemblance to the northern *Cryptogramme crispa*, Br., which, however, has the fertile and barren fronds different, while here they are alike.

Pellæa robusta. Hk. Sp. 2, 147; Hk. and Bkr. Syn. Fil. 149.

Cryptogramme robusta. Pappe and Rawson, 32.

Allosorus robustus. Kunze, Linnæa. Vol. 10, 502.

Between rocks near Goedeman's Kraal, Namaqualand (Drège). Common throughout Namaqualand (Lady Barkly, Bolus).

42. *PELLÆA PECTINIFORMIS*. Baker.

Plate XXXV. Fig. 2. Natural size.

Crown procumbent or shortly creeping, with abundant lanceolate, reddish scales. Frond simply pinnate, six to twelve inches long, one to three inches broad, on a stout stipe four to six inches long, which is scaly at the base, and like the rigid rachis clothed

with adpressed woolly scales. Pinnæ fifteen to thirty nearly opposite pairs, very shortly stalked, linear, rounded at the point, cordate, or slightly auricled at the base, three-quarters to one and a half inches long, one line broad; edges very much rolled back. Upper surface glabrous and shining, or like the under surface (except the indusium) slightly woolly. Rachis and pinnules very rigid and coriaceous. Involucre same texture as the frond, intramarginal. Pinnules when barren broader, and not revolute; and the lower ones reduced. Veins forked, free ("or very rarely anastomosing," Kuhn), but lost in the firm frond, and not easily seen.

Pellæa pectiniformis. Bkr. Syn. Fil., 2nd Ed., 147.

Pteris pectiniformis. Godet. Hb., Kuhn, Fil. Afr. 87 (with description).

Pteris Goudotii. Kze. Hb.

Pteris dura. Hk. and Bkr. Syn. Fil., Ed. 1, 147 (where *P. Burkeana*, Bkr., is included in it).

African islands, and South Africa south to Natal, at 1000 to 3000 feet alt., Umzinyate Falls, Inanda, and Killiecrankie (Buchanan), Umhloti (Wood), Transvaal (Bolos).

43 *PELLÆA LANCIFOLIA.* Baker.

Plate XXXI. Fig. 2. Nat. size. c pinnule, magnified.

Crown much tufted, slightly paleaceous, or almost naked. Frond lanceolate, three to six inches long, one to one and a half inches broad at the middle, rather narrower below, two-pinnate, glabrous and herbaceous, with a naked brown stipe, two inches long, and a naked rachis. Pinnæ almost sessile, a half to one inch long, half-inch broad; upper pinnæ entire or lobed; middle and lower pinnæ cut to the rachis into three to seven cordate, ovate, or deltoid, entire, oblique pinnules three to four lines long, two to three lines broad, cut away below into a broad petiole, or adnate. Barren fronds are very thin, and with rounded decurrent lobes, and the margin is crenate even when fertile. Involucre very wide, of same texture as the frond, except the margin, which is scarious, and undivided, or at least not regularly lobed. Baker remarks "differs from *P. profusa* by its naked rachis and very

broad indusium ;" but it seems to me to be as nearly connected with the cut forms of *P. duriculata*, Link.

In "Journal of Botany" the indusium is described as crenate, but in "Annals of Botany" this is omitted. The specimens I have examined are neither crenate nor regularly lobed, as *P. auriculata* always is.

P. lancifolia, Baker. in "Journal of Botany," July, 1874 ; "Annals of Botany," V., No. 18 ; Lady Barkly's revised List, No. 43.

Found only at foot of Kamiesberg, Namaqualand, where it was discovered by Sir Henry Barkly, and again collected by Mr. Bolus.

44. *PELLÆA CONSOBRINA*. Hk.

Plate XXXVI. Lower pinnæ, nat. size. b Pinnule magnified.

Crown tufted, paleaceous. Fronds 3 to 4-pinnate, deltoid, four to eighteen inches long and broad, on a naked, shining, brown, furrowed stipe, of equal length, paleaceous at the base. Pinnæ deltoid, but with larger pinnæ on the lower side ; secondary pinnæ also deltoid with larger pinnules on the lower side. Pinnules sessile, divided to near the rachis into two to five pairs of oblong or obtuse toothed lobes with a larger terminal one, or sometimes again pinnate and having lobed pinnules. Sori intramarginal, with a narrow membranous indusium. Pinnules narrowed when fertile, and not toothed as they are when barren. Whole frond glabrous, or with the stipe slightly paleaceous when young, coriaceous, and of a brownish green colour. *P. Bojeri*, Hk. is stated to be a form of this by Baker ("Syn. Fil. 150), but Wood's and Buchanan's plant so named is *P. involuta*.

Ecklon and Zeyher's specimen in Albany Museum marked "*Pteris capensis*, Thbg. 136" also belongs to this species, though the name is a mistake.

Pellæa consobrina. Hk. Sp. 2, 145 ; t. 117A ; Hk. and Bkr. Syn. Fil. 150.

Pteris consobrina. Kze. Linnæa, 10.526.

Pteris quadripinnata. Forsk, Swartz.

Cheilanthes quadripinnata. Kuhn, Fil. Afr. 74.

Allosorus consobrinus. Pappe and Rawson, 31.

Cheilanthes triangula. Kunze, *Linnæa*, 10. 536.

Cheilanthes atherstonei. Hk. Sp. II. 107 ; Pappe and Rawson, 37.

Cheilanthes firma. Moore ; Pappe and Rawson, 37 } teste Kuhn.

Cheilanthes linearis. Moore ; Pappe and Rawson, 37 }

Africa and African islands ; growing on open banks or near bush in the upper districts, 2000 feet and upward.

West.—Knysna (Miss Dalgairns).

East.—Kraka-kamma (E. and Z.), Albany (Dr. Atherstone), Howison's Poort (Holland), Boschberg 4500 (MacOwan), Oudeberg, Graaffreinet (Bolus, 172).

Kaff.—Komgha (Flanagan), Witbergen, Stormberg (Drège). Frequent above the forest at Perie, Dohne, Toise River, Kei Road, and S.W. of King William's Town.

Natal.—Upper districts down to Noodsberg (Wood), Maritzburg, Drakensberg, Umpumulo, &c. (Buchanan).

Transvaal (Oates), Pilgrim's Rest, Macamac Fields (M'Lea, 46).

(*PELLÆA ANDROMEDÆFOLIA.* Fèe.

Allosorus andromedæfolia. P. and R. 31 ; Kunze, *Linnæa*, 10, 503.

This is included by Pappe and Rawson, Kunze, and Lady Barkly, from Drège's specimens collected at Kendo, and is still retained in "Syn. Fil." (150), but was not seen by Pappe and Rawson nor Lady Barkly, while Kuhn excludes it from Africa as a mistake.

An unnamed sp. in Herb. Gub. without locality does not differ in any essential point from the description in "Syn. Fil." of *P. andromedæfolia*, but is certainly a dry grown and very much involuted form of *P. consobrina*. Mr. Baker, however, writes me that "*P. andromedæfolia* is in Hb. Drège from 'dry localities at Kendo'—Herb. Kew, Herb. Rawson."

45. *PELLÆA BOIVINI.* Hk.

Plate CXLVI. Natural size.

Fronde deltoid, two-pinnate or three-pinnate, four to nine inches long, three to six inches broad, on a shining black stipe three to six inches long. Pinnæ stalked, ascending, deltoid, in opposite pairs ; the lowest the largest, three inches long, two inches broad at the base, and having about four pairs of opposite

pinnules, of which the upper are simple, and the lower three-foliate; other pinnæ smaller upward, and mostly with simple pinnules. Pinnules coriaceous, three-quarter-inch long, two to three lines broad, broadest below the middle, and tapering upward to the blunt point, and downward to the cordate base; all shortly stalked, and with a black mid-rib prominent to the point on the under side. Rachis and secondary rachises black, and densely set with short brown tomentum. Sori intramarginal, with a very broad indusium. This species is near the larger form of *P. hastata* var. *glauca*, but has blacker, more rigid, and tomentose rachis, and broader indusium.

Found near Magalisberg, Transvaal, by Zeyher and Burke, and it also occurs in Madagascar, Mauritius, and India.

I have seen no South African specimen, but the description and figure are from Ceylon specimens kindly forwarded to me from Kew.

46. *PELLÆA NAMAQUENSIS*. Baker.

Plate XXVI. Fig. 2. Nat. size. b Pinnule, magnified.

Crown tufted, paleaceous, with linear brown scales. Fronds ovate pointed, one inch broad, two to four inches long, on a stout stipe one to two inches long, and having four to six pairs of deltoid sub-opposite pinnæ; the lower the largest, half-inch broad, three-quarters to one inch long, shortly stalked, equal sided, erectopatent, ascending, and cut to the rachis into several lobed, trifid, or pinnatifid pinnules, having a shortly cuneate base, and wide attachment, or sometimes shortly stalked. Rachises and stipe stout, brown, and shining, with scattered, small, stiff, brown, lanceolate, but not hair-like scales, which are more abundant towards the base. Texture firmly herbaceous; frond glabrous on both surfaces; indusium continuous, narrow, folding back early. Baker describes this as "about midway between *P. involuta* and *P. consobrina* in cutting and general aspect." It seems to me closely connected with *P. involuta*, but the specimens available are too few to allow the limits of the species to be accurately defined. The only specimens seen are the single fronds in Herb.

Gub. and in the Albany Museum, collected by Sir H. Barkly, and those in Mr. Bolus' Herbarium, collected by himself. Both are from foot of Kamiesberg, Namaqualand.

P. namaquensis. Bkr. in Jour. of Botany, July 1874; and Annals of Botany, Vol. V., No. 18, April 1891.

47. *PELLÆA INVOLUTA*. Baker.

Plate XXXVII. Natural size.

Rhizome shortly creeping or tufted, with linear, shining, light brown, hair-pointed scales. Frond four to nine inches long, two to three inches broad, lanceolate or oblong-lanceolate, two-pinnatifid or sometimes three-pinnatifid, on a channelled, brown stipe, equal in length to the frond. Stipe, rachis, and mid-ribs set with soft, spreading, hair-like, yellowish scales, very abundant below. Pinnæ one to one and a half inches long, plain, deltoid, hardly equal sided, cut to or near the rachis into entire oblong lobes, having a broad attachment, or the lower ones pinnatifid with one to four pairs of lobes; upper pinnæ less divided, more or less confluent. Texture firmly herbaceous; pinnæ glabrous on both surfaces, and edged by the narrow, white, membranous, intramarginal, and early reflexed, entire, but often undulated indusium. I cannot distinguish from this the Natal specimens in which the scales of the stipe are adpressed, more rigid, and brown, and the pinnules rounded at the base or almost stalked. These are the *P. Bojeri* of Buchanan's list, and of Wood's Natal Ferns.

This is a badly understood and most confusing plant. I find difficulty in drawing a line between it and *P. hastata*, var. *glauca*. Buchanan found the same difficulty, while Lady Barkly and Pappe and Rawson included both here, and the Graaffreinet specimens identified as this at Kew approach var. *glauca* very closely. The paleaceous stipe and rachis less divided, less triangular, and more plain frond, characterize this plant, which appears to be rather rare though widely spread. The connection with *P. consobrina* is much more distant, but *P. namaquensis* is very close.

Pellæa involuta. Baker Syn. Fil. Ed. II. 148.

Pteris involuta. Sw.; Schl. Adum. 46; Kze. Linnæa, 10.526; Pappe and Rawson, 51; Kuhn, Fil. Afr. 82.

Pellæa profusa. J. Smith; Hk. and Bkr. Syn. Fil. Ed. I. 148.

Cheilanthes profusa. Kze., Linn., 10,536; Suppl. to Schk. Fil., tab. 17; Hk. Sp. 2, 108.

Cheilanthes cornuta. Kze., Linnæa, 10,534; Pappe and Rawson, 36 (see under *Cheilanthes depauperata*).

Cheilanthes distans. Mett., var. *profusa*, Mett.; Kuhn, Fil. Afr. 71.

Pellæa Bojeri (Hk. ?) Buchanan's list; Wood's Natal Ferns.

South Africa only; north to Zanzibar.

West.—Silverfontein, Namaqualand, Buffeljagds-rivier, and Reitkuil (Drège).

East.—Oudeberg, near Graaffreinet (Bolus, 4200).

Kaff.—Komgha (Flanagan).

Natal.—Inanda, Umpumulo, Krantz-kloof, and abundant all along the road to Newcastle (Buchanan).

48. *PELLÆA HASTATA.* Link.

Plate XXXVIII. Natural size of small frond.

Rhizome subterranean, creeping, short, nearly naked. Frond very various, ovate-lanceolate, or sub-deltoid, one to three feet long, on a nearly naked, shining, brown, wiry stipe, one foot long, which, when young, has scattered, soft, adpressed, woolly scales toward the base. Frond generally two-pinnate, the lower pinnæ not longer than those above, and having one to four pairs of broadly lanceolate or ovate pinnules, three-quarters to two inches long, cordate or rounded at the sessile, but not adnate base, rounded at the point; crenate when fertile as well as when barren, as the indusium is slightly intramarginal. Indusium linear, narrow, membranous, not lobed, crenate, nor waved, and when mature standing at right angles to the frond. Colour deep green; texture coriaceous; veins distinct; upper surface glabrous; lower surface and secondary rachises in some plants densely villose, in others glabrous. Rachis deeply channelled in front, more or less villose in the upper part. This is a variable plant with a wide range of cutting.

- Pellæa hastata*. Link. Hk. Sp. II., 145, tab. 116B ; Hk. and Bkr. Syn. Fil. 152.
Pteris hastata. Sw. Schrad. Jour. 1800 ; Schl. Adum. 42 (not *Pteris hastata* of Thunberg or Kuhn).
Allosorus hastatus. Presl ; Pappe and Rawson, 30.
Cheilanthes hastata. Kze., Linnæa, Vol. 10. 532.
Cheilanthes hastata, var. *stenophylla*. Kze., Linnæa, 10. 533.
Cheilanthes hastæfolia. Kze., Linn., 23. 307.
Pellæa viridis. M'Ken.
Pteris viridis. Forsk. fl. œq. Arab. (1775) ; Kuhn, Fil. Afr. 89.
Cheilanthes viridis. Sw. ; Hk. Sp. II. 110.
Adiantum hastatum. Linn. Suppl. 447.
Pteris auriculata. Thunb. Prod. 172 ; Flor. Cap. 733.

Lady Barkly includes here Pappe and Rawson's *Allosorus coriifolius*, P. and R., and *Allosorus capensis*, Pr., both of which belong to *Pteris aquilina* ; also, *Cheilanthes firma*, Moore, and *C. linearis*, Moore, both of which were afterwards merged by Moore into *C. triangula*, Kze., a synonym of *P. consobrina*.

Africa and African islands. It is perhaps the most common fern throughout the whole of South Africa, growing both in the forest and on the veldt, from the coast to the mountains, wherever it has a little bush shelter, and frequently without shelter.

Var. *MACROPHYLLA* (Plate XXXIX., nat. size) has the frond usually only once pinnate, with pinnæ much larger, and more pointed, than the pinnules in the ordinary form ; or sometimes with the lowest pinnæ again divided. It varies considerably, and is possibly only a young state, and passing gradually into the ordinary form. Not uncommon in forest.

- Allosorus hastatus*, var. *macrophylla*. Pappe and Rawson, 30.
Cheilanthes macrophylla. Kze., Linn., 23. 307.
Pellæa hastata, var. *macrophylla*. Hk. Sp. II. 146.
Cheilanthes hastata, var. *macrophylla*. Kze., Linn., 10. 81.

Var. *GLAUCA*, mihi (Plate XL., nat. size). Fronds triangular, three to eight inches long, two to five inches broad, on a stipe one to four inches long ; two-pinnate, with the pinnules deeply lobed, or sometimes three-pinnatifid. Lower pinnæ largest, equal sided, ascending, erecto-patent, or with the pinnules on both sides of the

rachis pointing upward so as nearly to meet. Frond glabrous on both surfaces, firmly herbaceous, glaucous, and with the brown or nearly black rachis and stipe almost destitute of scales, except at the base. It is not unlike *P. calomelanos*, and has been passed by high authorities from dried specimens as a variety of that fern; but the stipe is not so black, nor the texture so coriaceous, and as the fronds get old their connection with *P. hastata* becomes more apparent.

There are two forms of it, often growing together, which in their extremes might well be set down as distinct species, but they run into one another, and the larger one approaches the ordinary *P. hastata*, though generally distinguishable. Its close connection with *P. involuta* has been noticed under that species.

The smaller form is seldom more than four inches high, quite deltoid, and glaucous, and with the small pinnules meeting above the rachis, and cut into decurrent lobes. The larger form is generally over six inches and under twelve inches in height, not so glaucous, and with pinnules not so much lobed, but sometimes cut again into distinct oval segments.

P. hastata, Link, var. *glauc*a, Sim, Kaff. Ferns.

Pteris adiantoides. Bory.

This form grows on the top of nearly bare rock or among stones.

East.—Bellerne, near Bedford (Holland).

Kaff.—S.W. of King William's Town, Izeli, Mount Coke, &c.

Natal.—(Buchanan), Matebeleland (Fry), Damaraland at Okahandja (Marloth).

49. *PELLÆA LEUCOMELAS*. Baker.

(Not seen. Description translated from Kuhn, Fil. Afr., p. 83).

“Rhizome short, densely set with black keeled scales. Frond thick, green above, paler below, glabrous. Petiole paleaceous at the base, one inch long, like the rachis ebeneous shining; upper surface of the rachis depressed or channelled margined. Frond five inches long, ovate-oblong, two-pinnate.

Pinnæ patent, approximate, distinctly petioled, one and a half inches long, ovate or ovate-oblong, obtuse. Pinnules three to five-jugate, very shortly petioled, obliquely oblong-ovate, somewhat pointed, distinctly petioled in the lower part, sessile above; terminal pinnules often three-lobed; veins immersed, repeatedly forked; margin revolute, narrow.

Allosorus. Kze. Hb.; Mett. MSS. South Africa (Breutel).

Gathered also by Mr. Todd, of Inanda, in the Transvaal, and Mr. Wood, who saw the specimen, describes it as having the colour and texture of *P. calomelanos*, together with the form of *P. hastata*, Link. Possibly it belongs to *P. hastata*, Link., var. *glauca*.

Pellæa leucomelas. Baker, Syn. Fil. 478.

Pteris leucomelas. Mett. MSS.; Kuhn, Fil. Afr. 83.

50. *PELLÆA CALOMELANOS*. Link.

Plate XLl. Natural size.

Crown tufted, shaggy, with long narrow linear brown scales. Frond two to three-pinnate, deltoid, six to eight inches long, four to six inches broad, with a stout stipe of three to four inches, which is slightly paleaceous, with adpressed woolly scales below, but in the upper part, rachis, and petioles, quite naked, wiry, and shining black. Lower pinnæ deltoid, erecto-patent, with three to five pairs of pinnules, or sometimes these are again pinnate; pinnules distinctly though shortly stalked, two to six lines broad and long; cordate, ovate-deltoid, hastate, or three-lobed, but generally from a cordate base, and always more or less rounded at the point; very thick in texture, glaucous, and glabrous. Terminal pinnule of each pinna not much different, but generally three-lobed. Involucre quite marginal, narrow, membranaceous, entire, not opening out flat when mature. This is more rigid and leathery in texture than any of the other *Pellæas*, and when the pinnæ get old they drop off, leaving the petiole as if they had been jointed on to the top of it. Some specimens are remarkably hastate in every pinnule, others almost round, but often the first fronds are round, and later ones hastate.

Pellæa calomelanos. Link ; Hk. Sp. II. 140 ; Hk. and Bkr. Syn. Fil. 152.

Pteris calomelanos. Sw. ; Schrad. Jour. 1800 ; Schl. Adum. 43, tab. 24 ; Kze., Linnæa, 10.525.

Allosorus calomelanos. Pappe and Rawson, 30.

Pteris hastata. Thunb. Prod. 172 ; Flor. Cap. 733 ; Kuhn, Fil. Afr. 81 (not *Pteris hastata*, Sw.).

Africa, Bourbon, and India ; growing always among stones or in the crevices of rocks ; widely scattered, but frequent over the whole colony and Natal ; found also in the Free State (Harper), Transvaal (Zeyher and Burke), Damaraland (Marloth), Matebeleland—very much ivy-leaved—(Fry).

51. *PELLÆA BURKEANA.* Baker.

Plate XXXV. Fig. 1. Natural size.

Crown tufted ; fronds three to nine inches long, two to four inches broad, deltoid, pinnate or 2-pinnate, coriaceous, glabrous. Upper pinnæ linear-lanceolate from a cordate base, rounded at the point, one to one and a-half inches long, one and a half to three lines broad ; lower pinnæ similar, or with a similar terminal pinnule and one to four pairs of smaller side pinnules. Veins anastomosing freely, but rather obscure, except the central one which is like the rachis and stipe, black, shining, and naked. Involucre rather narrow, intramarginal. When barren the pinnules are rather wider than when fertile. It seems to vary considerably ; one specimen in Herb. Gub. has frond eighteen inches long, and resembling *P. hastata*, Link., but with the indistinctly reticulated venation.

Pellæa Burkeana. Bkr., Syn. Fil. 153.

Pteris Burkeana. Hk., Sp. II. 213, tab. 126 β.

Pteris dura. Willd ; Kuhn, Fil. Afr. 80.

S. Africa and African Islands ; not known south of Natal. It grows in crevices of wet rocks.

Transvaal.—Macalisberg (Burke).

Natal.—Not rare but not very common (Wood), Great Noodsberg, Inanda, Umpumulo (Buchanan).

Genus XV.—PTERIS, Linn.

Indusium marginal, continuous, opening inward, and bearing the capsules in an uninterrupted, narrow line, along its axil. This genus contains plants of various habit, and has been split into several genera by some authors, while others keep it entire, or unite *Pellæa* and *Lonchitis* with it. Several species are widely distributed, and the others are found all over the world.

Key to the species :—

§ Veins free; involucre single; rhizome only a procumbent crown = *Eu-pteris*.

52. *P. longifolia*. Frond simply pinnate.

53. *P. Cretica*. Pinnæ linear, the lower with one or two linear pinnules on the lower side.

54. *P. quadri-aurita*. Frond 2 to 3-pinnate, barren pinnules not toothed, or only very slightly.

55. *P. flabellata*. 2 to 3-pinnate, barren pinnules distinctly serrate.

§§ Veins free, except along the mid-ribs, where there is one line of areolæ on each side. Rhizome short = *Campteria*, Presl.

(*P. bi-aurita*, an anastomosing form of *quadri-aurita*.)

56. *P. Buchanani*. Frond 2 to 3-pinnate, barren pinnules distinctly serrate.

§§§ Veins sometimes anastomosing freely = *Litobrochia*, Pr.

57. *P. incisa*. Rhizome long, with distant 2 to 3-pinnate fronds.

§§§§ Veins free, involucre sometimes double = *Pæsia*, St. Hellere.

58. *P. aquilina*. Rhizome long, with distant, 2 to 3-pinnate fronds.

52. *PTERIS LONGIFOLIA*. Linn.

Plate XLII. Natural size.

Rhizome procumbent or shortly creeping, paleaceous. Frond simply pinnate, lanceolate, one to three feet long, three to eight inches broad, glabrous, and with a glabrous, green, channelled rachis, and a short, round, herbaceous stipe, set with numerous, linear, white, spreading scales, toward the base. Pinnæ about twenty pairs, three to four lines broad, two to four inches long about the middle of the frond, considerably reduced downward, and slightly reduced upward; and the frond rather abruptly terminating in a terminal pinna similar to the others but longer; all linear pointed, from a wide, rounded or cordate, sessile base,

and serrate when not fertile. Indusium narrow, herbaceous in texture like the frond, except the margin, which is scarious and entire. Veins free, slightly forked, parallel.

Pteris longifolia. Linn. Sp. 1531; Hk. Sp. II. 157; Hk. and Bkr. Syn. Fil. 153; Kuhn. Fil. Afr. 83.

Pteris costata, Bory.

Pteris ensifolia, Swartz.

Thunberg's *Pteris cuspidata* may have belonged to this, but is set down by Kuhn as barren fronds of *Angiopteris* (*Marattia*).

Throughout the tropics and a little beyond; nowhere common in S. Africa, but scattered, growing beside open running water.

East.—Alexandra Forest (Holland), Uitenhage, possibly naturalized (MacOwan).

Kaff.—Kongha (Flanagan).

Natal.—Hot springs at Inhlumbiti, 2500 ft. alt.; Fields Hill; Weenen Thorns', Cathkin; Inanda (Buchanan); Verulam; Umlaas (Wood).

Transvaal.—Magalisberg (Burke), Macamac (McLea), Pretoria, Aapie's Poort (Dr. Rehmann, 4047).

53. *PTERIS CRETICA*. Linn.

Plate XLIII. Small frond, natural size. b. Sporeling plant.

Rhizome shortly creeping, naked, subterranean. Fronds glabrous, simply pinnate, but with lower pinnæ forked; six to twelve inches long, four to ten inches broad, on a glabrous, green, furrowed stipe, one foot or more long. Pinnæ two to five opposite pairs, sessile, linear-lanceolate, pointed, sharply serrate when barren, with white teeth or teeth connected into a white margin. Lower pinnæ largest, with one to two linear pinnules forking from them on the lower side. Upper three pinnæ connected at the base, and slightly decurrent, the rest of the rachis not winged. Fertile pinnæ three to four lines broad, barren pinnæ often broader. Indusium narrow, membranaceous, marginal, but not a continuation of the edge of the frond. Veins parallel, once forked.

Var. *stenophylla*, has 3 to 5 pinnæ only, all rising together, and is known as the five finger fern, but does not adhere strictly to its character.

Pteris Cretica. Linn Sp. 7807; Schk. Fil. 85. tab. 90; Schl. Adum. 40; Thunb. prod. 171; Fl. Cap. 732; Kze. Acot. Afr. 43; Pappe and Rawson, 26; Kuhn. Fil Afr. 79; Hk. and Bkr. Syn. Fil. 154.
Pteris serraria. Sw. Schrad. Jour. 1800.

Frequent in the tropics, and not uncommon in S. Africa, growing in open glades in the forest.

West.—Swellendam (P. and R.), Knysna (Burchell 5571), Seven Oaks (Holland), Grootvader's Bosch (Thunberg), Hang-klip (Mund.), George, Koratra (Drège).

East.—Zwartkops River (Rawson), Kat River, Winterberg (P. and R.), Bedford (Miss Cook), Boschberg (MacOwan).

Kaff.—Komgha (Flanagan), St. Augustine's, Transkei (Baur.), Perie; Frankfort; Dohne; Cathcart, &c.

Natal.—Abundant in upper districts (Wood).

Transvaal.—Macalisberg (Sanderson).

(*PTERIS SERRULATA*. Linn. Fil. A Chinese species, which somewhat resembles *P. Cretica*, but has the rachis distinctly winged throughout, is mentioned in Hk. and Bkr. "Syn. Fil." to have been received from Natal, from R. W. Rawson, Esq.; but is only known in cultivation to Natal Botanists.

P. serrulata, Forsk. is according to Kuhn our *P. flabellata*; and *P. serrulata*, Pappe, appears to be our *P. Buchanani*; both very distinct from *P. serrulata*, L., but both Natal plants, and possibly the cross naming may account for the above locality.)

54. *PTERIS QUADRIAURITA*. Retz.

Plate XLIV. Part of lower pinna. Natural size.

Crown procumbent, or with a short rhizome; set with numerous short, brown, lanceolate scales. Frond 2-pinnate or 3-pinnatifid, glabrous, one to three feet long, one to two feet broad, on a nearly naked yellowish stipe one to two feet long. Pinnæ about ten pairs, six to twelve inches long, one to one and a-half inches broad, cut to near the mid-rib into linear, obtuse, entire, or slightly serrate pinnules; and with an attenuated, narrow, pointed, terminal pinnule. Terminal pinna similar to the others, but longer. Lower pinnæ with 2 to 4 short similar pinnæ on the lower side. Indusium narrow, membranaceous. Sori usually in the lower half

of the pinnules only, but the upper half is quite entire. Along the mid-rib on the upper surface, this bears a strong prickly-like scale at the base of every side rib. Also about six of these scales are on the vein in each pinnule. Texture thin, but firm. Veinlets numerous, distinct, free, usually forked. The pinnæ are not usually cut quite to the mid-rib, but so near that the lower veins from two neighbouring pinnæ do not unite.

In *Pteris bi-aurita*, L. they do unite; but otherwise the plant is very similar to this. Buchanan, who was living where *P. quadriaurita* is abundant, points out that it has free veins, and that Kuhn had gone wrong in placing Pappe and Rawson's *P. catoptera* under *P. biaurita*, while shown by the Rawson Herb. to be *P. quadriaurita*, Retz. which he omits. *P. biaurita*, L. is however found in the same Herb, without locality, and is not otherwise known to belong to our district, and Mr. Baker informs me that there is no Cape specimen of it in Kew Herbarium. Pappe and Rawson give as localities for *Campteria biaurita* "Magalisberg (Zeyher), in the forests of Natal (Plant)," and remark "very like *P. catoptera*, Kze., but sufficiently different by the venation," while their generic character for *Campteria* is, "like *Pteris*, but lower veins anastomosing and arching at the sinus."

Lady Barkly only adds to the confusion by giving *Campteria biaurita* as a synonym for *P. quadriaurita*.

There are evidently two forms of *P. quadriaurita*. All the Natal specimens I have seen are slightly serrate all along the barren margins, while those from the Transvaal are quite entire, and thinner, but more leathery in texture. In Herb. Bolus. the latter variety is named by Baker, *P. quadriaurita*, var. *setifrons*.

P. quadriaurita. Retz.; Hk. Sp. 2, 179, tab. 134 β ; Hk. and Bkr. Syn.

Fil. 158; Buchanan's list, no. 38; Wood's Natal Ferns, 15.

P. catoptera. Kze. Linnæa, Vol. 18, p. 119; Pappe and Rawson, 26.

Found throughout the tropics; by streams, or in bush, but not extending south of Natal, where it is found from the coast to the upland mountains.

Transvaal.—Magalisberg (Zeyher), Drakensberg near Macamac Gold Fields (J. H. McLea, 41).

55. *PTERIS FLABELLATA*. Thunberg.

Plate XLV. Frond reduced. b Barren pinnules natural size.
c Fertile pinnules natural size.

Crown erect or procumbent, paleaceous. Fronds of mature plants two to three-pinnate, deltoid, glabrous, two to four feet long, one and a half to three feet broad, on a strong, angular, slightly villose stipe, one to three feet long, and having a few scattered scales toward the base only. Pinnæ eight to twelve opposite pairs, lanceolate, or simply pinnate, except the lower two to three pairs, which are deltoid, and have several similar but smaller pinnate pinnæ on the lower, or on both sides, but longest on the lower side. Lowest pinnæ often one and a half feet long, one foot broad at the base, with five to seven pairs of alternate pinnæ; those above simply pinnate on the upper side and toward the point, but with one to four pinnate pinnæ on the lower side. Pinnules linear, one to two lines broad, one to two inches long, with suddenly decurrent base. Terminal pinna not different, and not much larger than others. Barren pinnæ, and the barren points of fertile pinnæ, strongly toothed, and wider than the fertile parts. Involucre continuous along most of the pinnule, narrow, fringed. Veins all free and once forked, more distant than in *P. quadriaurita*.

This splendid fern is one of the greatest ornaments of our forest scenery. Its light green foliage contrasts well with the dark foliage of the trees above, and as the fronds rise on stalks one to two feet long, then spread horizontally, they generally show their fine outline well above the undergrowth. The amount of cutting varies exceedingly; sometimes the lower pinnæ are simply pinnate, while in other cases the lower two or three pairs of pinnæ are very large and bi-pinnate for two-thirds of their length. The sori sometimes extend only along part of the pinnules, leaving the upper half barren and serrated; but more frequently on old fertile plants the fronds have every edge covered all along with sori. When this condition occurs the plants are three to four feet high and broad, with an upright habit, and, of course, the sori make

the pinnules narrower and not serrated, so the appearance is altogether unlike the flat, serrated, and less divided younger barren plants.

Like *P. quadriautra* this has a scale at the base of every pinnule on the upper surface of the mid-rib.

Pteris flabellata (originally *P. flabellulata*). Thunb. Prod. 172; Flor. Cap. 733; Hk. and Bkr. Syn. Fil. 161.

P. arguta, Aiton, Hort. Kew; Swartz; Schl. Adum. 43; Kze., Linnæa. 10.524; Pappe and Rawson, 26.

P. arguta. Ait., var *flabellata* (Thbg.), Mett.; Kuhn, Fil. Afr. 76.

P. serrulata. Forsk. fl. œq. Arab., 187; Swartz, Syn. 108.

Africa, and African islands; common throughout South Africa.

West.—Tulbagh, Table Mountain, &c.

East.—Karakamma, Zuurberg, Grahamstown, Bedford.

Kaff.—Abundant in all the forests, Bazaja (Baur.), Komgha (Flanagan).

Natal.—All over the colony.

Transvaal.—Magalisberg (Zeyher).

(*P. TREMULA*, R. Br., a New Zealand and Australian species, is mentioned by Buchanan and Wood as having been found by the latter at Umhloti, Natal. Mr. Wood now writes that when he found this fern on his farm he thought it might have escaped from cultivation, and now he is sure of it.

Baker ("Syn. Fil.," 161) mentions having seen a specimen of it in Herb. Rawson, from the Cape, named *P. caffra*, Pappe. Neither this name, nor any Cape specimen of *P. tremula*, is now, in Herb. Gub., which includes Dr. Pappe's collection, and as the species is otherwise unknown in South Africa, except in cultivation, it is assumed to have been a mistake.

56. *PTERIS BUCHANANI*. Baker MSS.

Plate XLVI. Upper side of lower pinna, natural size.

Rhizome creeping. Fronds two to three-pinnate, glabrous, two to four feet long, one and a half to three feet broad, more or less tripartite, on a stipe one to three feet long. Pinnæ stalked, numerous, lanceolate, and cut nearly, but not quite to the rachis, into linear pinnules, one to two inches long, two lines broad,

sharply toothed where not fertile, and not narrower where fertile than above. Lower pinnæ much largest, having several pinnate pinnæ on each side, but largest on the lower side. Lower pinnules sometimes distinct, and again pinnatifid or lobed; others more or less connected along the mid-rib, so that the lower veinlets of one pinnule unite with those of its neighbours, forming regular areolæ along the mid-rib. Texture herbaceous; colour green. Involucre half-line broad, white and membranaceous, distinctly intramarginal, not reaching the point of the pinnules. In young plants the anastomosing venation is quite distinct, and the frond is roundly, five lobed, or three partite in general outline, but old fertile fronds, except in form, become more like those of *P. flabelata*, Thbg., and the pinnules are often cut quite to the mid-rib, or so near that the veins do not unite. It then resembles *P. flabelata* closely. The division *Campteria*, to which this species belongs, is characterised by the veins uniting only along the mid-rib; whereas in the division *Litobrochia* they unite freely throughout; but this character does not hold rigidly, and it is evident that this species is a form of *P. (Litobrochia) marginata*, Bory, quoted by Baker ("Syn. Fil.," 172) as *Kaffrarian*, and *P. serrulata*, Pappe, is stated by Lady Barkly to be the same thing.

P. Buchananii. Baker MSS.; Buchanan's list, No. 42; Lady Barkly's list, No. 56.

West.—Knysna (Lady Barkly).

East.—Tzitzikamma Forest (Rawson Herb.).

Kaff.—Transkei near Main (Mrs. Young), Evelyn Valley, Perie.

Natal.—Intshanga, Karkloof, and Entumeni (Buchanan), Biggarsberg (Todd).

57. *PTERIS INCISA*. Thunberg.

Plate XLVII. Part of frond, natural size.

Rhizome slender, widely creeping underground. Frond glabrous, glaucous, more or less deciduous, two to three pinnate, one to three feet long, nine to eighteen inches broad, on a naked, herbaceous, glaucous stipe, six to twelve inches long. Pinnæ

opposite, lanceolate, sessile ; in young plants lobed or pinnatifid, but in mature plants cut into distinct, lanceolate, or ovate pinnules, which have a wide adnate base, and are often more or less irregularly lobed or pinnatifid below, or on lower pinnæ usually again fully pinnate. Barren frond, and barren tips of fertile pinnules, slightly crenate, but not toothed. Texture thick, but brittle. Involucre continuous, narrow ; veins sometimes anastomosing freely, especially on the young plants ; often quite free in old fertile plants, and Burchell's 7420, as sent from Kew to Herb. Gub., has all the veins free. This species is easily recognised by its spreading rhizome, glaucous colour, and entire (*i.e.* not toothed) pinnules, but the fronds vary a good deal in cutting.

Pteris incisa. Thunberg Prod. 171 ; Fl. cap. 733 ; Schl. Adum. 44, tab. 25 ; Kze. Linnæa, 10.44 ; Pappe and Rawson, 26 ; Kuhn, Fil. Afr. 82 ; Hk. and Bkr. Syn. Fil. 172.

Pteris vespertionalis. Labill.

Litobrochia incisa. Presl.

Widely scattered in the tropics ; growing in damp ground.

West.—Hangklip (Drège), Campsbay (Ecklon), Table Mountain at Newlands, Wynberg, &c., Hottentot's Holland, Swellendam (Holland), Zuurbraak, Swellendam (Burchell, 7240).

East.—Tzitzikamma.

Natal.—Noodsberg, Kranzkloof, Inanda (M'Ken), Umpumulo (Buchanan).

58. PTERIS AQUILINA. Linn.

Plate XLVIII. Frond and rhizome much reduced. b. Fertile pinnule, nat. size. c. Pinnules from young seedling plant, nat. size.

Rhizome subterranean, stout, creeping, several yards long, slightly branched, and with few roots. Frond 3-pinnate, one to three feet long, one to two feet broad, on a stout, naked stipe one foot long. Pinnæ in opposite pairs, sessile, all alike in shape, tapering from a wide base, the lowest sometimes longest, but more frequently rather shorter than the next pair. Upper pinnæ pinnatifid or simply pinnate, generally cut almost to the rachis into close, linear, bluntly pointed pinnules, fertile throughout ; lower pinnæ similar at the point, but towards the base having distinct

pinnæ cut in a similar manner, which increase in size downward, and are about equal in the upper and lower side of the pinna. Pinnæ set nearly horizontal, so that each pair overlaps those under. Involucre continuous round the entire pinnule, intramarginal, much fringed at the edge. Sometimes it has an indusium under as well as over the capsules, which is the characteristic of the section *Pæsia* to which this species belongs. Fronds coriaceous, glabrous above except when quite young, but villose below in the S. African form, which was separated by Thunberg under the name *P. capensis*, on this account. Veins forked, but free.

The Bracken, as this is called, is the most cosmopolitan, and in many parts of the world the most common fern; but with us, though not uncommon, it is confined to certain localities. It has a very long underground rhizome, from which the fronds rise singly at considerable distances, and this makes it a difficult fern to introduce from the wild state into the rockery. If taken when a seedling however—before the rhizome has begun to get long—it is not only very much prettier at first, but more easily managed ever after. When found in the sporeling state, as it often is soon after a bush fire, the fronds are quite delicate in texture, yellowish green, with crenated pinnules, and grow in a tuft, from which afterwards the rhizome starts to run. It is in that state not easily recognised as Bracken, and looks like *Hypolepis an-thriscifolia*.

Pteris aquilina. Linn. ; Hk. and Bkr. Syn. Fil. 163.

Pteris lanuginosa. Willd.

Pteris aquilina. L. var. *lanuginosa*, Hk. Sp. II., 196 ; Kuhn. Fil. Afr. 76.

Pteris capensis. Thunb. Prod. 172 ; Fl. cap. 733 ; Schl. Adum. 45, tab. 25 ; Kze. Linnæa, 10.527.

Pteris lanuginosa, var. *β. capensis*. Agardh.

Allosorus capensis. Pappe and Rawson, 32.

Allosorus hotentottus. Presl.

Pteris coriifolia. Kze., Linnæa, 18.120.

Allosorus coriifolius. Presl. ; Pappe and Rawson, 32.

Lady Barkly in mistake places *A. capensis* and *A. coriifolia* under *Pellæa hastata*, Link.

Cosmopolitan ; not uncommon, but rather local in South Africa.

West.—Abundant all round Table Mountain, Paarlberg, Hex River, Worcester, Knysna, &c.

East.—Zuurberg, Albany, Graaffreinet, Somerset East, Kat River, &c.

Kaff.—All along the forest range, mostly above the forest, and most abundant, and vigorous where bush fires have lately cleared the ground.

Almost absent from the low grass veldt. Komgha (Flanagan).

Natal.—All over the colony.

Free State (Harper), Transvaal, Magalisberg (Sanderson).

Genus XVI.—*LOMARIA*. Willd.

Sori occupying the whole underside of the contracted fertile pinnæ, except the mid-rib, and covered by a continuous marginal or almost marginal indusium opening inward. Fertile fronds usually distinct. A very natural genus in which most of the species agree in habit, having dimorphous fronds, and sub-erect rhizomes, or erect caudices. One of our species, *L. punctulata*, sometimes adheres to the above generic character, but the sori vary, and forms of it occur answering to *Blechnum*, *Asplenium*, and *Scolopendrium*. *Blechnum australis*, which also varies, frequently has the fructification answering to this genus.

Synopsis of the species.

§ Pinnæ of barren frond attached to the mid-rib along the whole of its widened base.

59. *L. inflexa*. Barren frond one foot long ; fertile frond six to nine inches long, one inch broad.

60. *L. attenuata*. Both barren and fertile fronds three to five feet long, eight to ten inches broad at the middle.

§§ Pinnæ of barren frond narrowed to the base or stalked.

61. *L. punctulata*. Pinnæ numerous, the lower gradually much reduced ; rhizome sub-erect.

Var. *Atherstoni*. Sori close to and parallel with the mid-rib ; indusium straight as in *Blechnum*.

Var. *intermedia*. Sori close to the mid-rib, but indusium not straight.

Var. *Krebsii*. Sori medial, two meeting face to face, as in *Scolopendrium*.

62. *L. procera*. Lower pinnæ not reduced ; rhizome creeping.

63. *L. Boryana*. Lower pinnæ not much reduced, caudex erect, tree-like, several feet high.

59. *LOMARIA INFLEXA*. Kunze.

Plate XLIX. Natural size. b. Fertile pinna, magnified.

Crown three to four inches long, one inch diameter, sub-erect, densely clothed with dark brown, lanceolate scales. Fronds simply pinnate. Barren fronds twelve inches long, one to one and a half inches broad, lanceolate, and tapering gradually to both ends. Rachis destitute of scales, except below the pinnæ, which begin one inch above the crown, but that portion is covered with long, narrow, brown scales. Pinnæ blunt or slightly pointed, suddenly widened at the base on the upper side, connected with the rachis along the whole base. Texture leathery. Fertile frond about six inches long, and one inch broad; pinnæ very close, comparatively broad, and more or less infolded. Indusium very broad, afterwards torn. The barren fronds are not unlike those of *L. attenuata*, but the fertile fronds are very different.

This species has caused much confusion. Lady Barkly mentions the name as a synonym for *L. punctulata*, with which it has no connection, but introduces into her list the name *L. discolor*, Willd., upon the same plant. Baker, in 2nd Ed. of "Syn. Fil.," makes it *L. discolor*, W., var. *Natalensis*, Bkr., and in "Kaffrarian Ferns," I named it *L. lanceolata*, Spr., in mistake.

L. inflexa. Kze., Linnæa, 18.117; Suppl. to Schk. 150, tab. 65; Pappe and Rawson, 28; Hk. Sp. III. 37.

Blechnum inflexum. Kuhn, Fil. Afr. 92.

Lomaria discolor, Willd., var. *Natalensis*. Baker Syn. Fil. Ed. II. 481; Buchanan's list, No. 44.

Lomaria lanceolata. Sim, Kaff. Ferns, 34 (not *L. lanceolata*, Spr.).

South Africa only; growing beside open streamlets.

Kaff.—Above Perie forest between Evelyn Valley and Kabula; in one place only, but there abundant.

Natal.—Found by Gueinzius, Nottingham, Karkloof, and on Drakensberg at Cathkin abundant (Buchanan; Wood).

60. *LOMARIA ATTENUATA.* Willd.

Plate L. a. Part of barren frond, natural size. b. Part of fertile frond, natural size.

Crown shortly procumbent, branched, making a tufted mass, and set with narrow, brown scales. Both barren and fertile fronds ovate-lanceolate, simply pinnate, glabrous, coriaceous, three to five feet long, eight to twelve inches broad at the middle, tapering to both ends, and having a nearly naked stipe, six to twelve inches long. Barren pinnæ adnate at the base, alternate, linear, lanceolate, four to six lines broad, meeting at the base, except the lower ones, which are separate, and very much reduced. Fertile pinnæ separate, linear, one to two lines broad and pointed; indusium broad, torn, or fringed. Veins forked, often ending in transparent cells near the edge of the frond. This splendid fern generally grows in clumps of four or five crowns together, each with twelve to twenty fronds. The pinnæ are about equal in breadth for three-fourths of their length, then gradually taper to a long narrow point, while at the lower end they widen out at the very base and are connected with the rachis all along, meeting the base of the next pinna. The narrow pinnæ of the fertile frond are about six inches long, and curve gracefully outward. In the seedling plants the fronds are entire at first, and afterwards waved (Plate LI., Fig. 2). Sometimes plants become fertile when only one foot high if dry grown, but the fertile frond is then a miniature of the ordinary, and not contracted as in *L. inflexa*. Young barren fronds are sometimes green, but often of a bright pink colour.

A form occurs in which the barren fronds are distinctly bi-pinnate on the lower half, and wavy and crisped in the upper portion (Plate LI., Fig. 3). This is *Lomaria heterophylla*, Desv. (*Blechnum*, Schl.), but is not constant enough in its character to deserve a name, and Kunze uses the name *L. heterophylla*, Desv., for the ordinary form of this species. Kunze also mentions *L. hamata*, Klfs., a variety with sterile pinnæ narrower, fertile, falcate. *L. decipiens*, P. and R., seems to have been founded on young plants of *L. attenuata*, Willd.

Lomaria attenuata. Willd.; Sp. Pl. V., 290; Kze. Linnæa, 18.116;
Pappe and Rawson, 28; Hk. and Bkr. Syn. Fil. 176.

Lomaria gigantea. Klfs.

Blechnum giganteum. Schl. Adum. 36; tab. 20 and 22, fig. 1.

Lomaria heterophylla (Desv. see above), Kunze, Linn. 10.506; Pappe and Rawson, 27.

Blechnum onocleoides. Swartz.

Onoclea attenuata. Swartz. Schr. Jour.

Blechnum polypodioides. Kuhn, Fil. Afr. 92.

Osmunda polypodioides. Sw. prod. 127.

America (central), Polynesia, African Islands, and South Africa: growing in deep, wet, and shady ravines, and about waterfalls in the forest; often in water.

West.—Kerstenbosch (Bergins), Dutoitskloof, ravines on Table Mountain above Wynberg, George (Drège), Caledon, Koratra, Krom River.

East.—Grahamstown, plentiful; Krakakamma, Kat River, &c.

Kaff.—Alice, Thaba N'doda, Perie, Frankfort, Stutterheim, Toise River, &c.

Natal.—Common all over the colony.

Transvaal.—Magalisberg (Sanderson, Bolus).

The bi-pinnate form grows at Frankfort, Perie, and Bedford; and Desvaux' plant is from "Prom. Bon Spei."

(*LOMARIA SPICANT*. Desv.

(Pappe and Rawson, 29; Hk. and Baker, Syn. Fil. 178.

Blechnum spicant. J. Smith; Kuhn, Fil. Afr. 93.

Blechnum boreale. Sw.; Schl. Adum. 38; Schk. Fil., tab. 110.)

This northern species is included by Schlechtendal from the Cape on the strength of a specimen in Herb. Bory de St Vincent, collected by Mr. Riche, but as it has not been seen since, south of Morocco and Madeira, the locality is doubted by Kuhn, and omitted by Baker. No South African specimens exist in South African herbaria, and it is, therefore, omitted as a mistake).

61. *LOMARIA PUNCTULATA*. Kze.

Plate LII. a. Barren frond, nat. size. b. Fertile frond, nat. size.

c. Section of fertile pinna.

Varieties in Plates LIII., LIV., LV., LVI.

Crown stout, erect, or shortly procumbent, paleaceous. Fronds

simply pinnate, coriaceous, glabrous, widely lanceolate, one to two feet long, three to six inches broad at the middle, tapering to the point, and to the short slightly paleaceous stipe. Rachis naked, channelled. Pinnæ alternate, numerous, one to every three-quarter-inch; pinnæ of the barren frond somewhat falcate, two to three inches long, four lines broad, tapering to the sharp or rounded point, cordate at the base, or hastate, or auricled on the upper side, connected to the rachis by a short stalk only, or the upper pinnæ somewhat adnate at the base. The lower pinnæ are more distant, and reduced to rounded deflexed auricles. Fertile pinnæ two to three inches long, one to two lines broad, less pointed, and less cordate at the base, except the lower ones, which are short, and often more or less barren. Involucre continuous, marginal, or intramarginal, nearly entire, broad; sori often covering the whole underside except the mid-rib. This is a most changeable plant; sometimes not unlike a small state of *L. attenuata*, W., but distinguished by its free pinnæ; at other times having the character of *Blechnum*, and difficult to distinguish from *Blechnum australe*, L., with which it is confused in several Cape herbaria.

A two-pinnatifid form (Plate LIII.) sometimes occurs, not unlike a similar form of *B. australe*, and like it, fertile and falcate in the upper pinnæ, and barren below; but it does not appear to be constant.

As some of the varieties of *L. punctulata* are more or less permanent, and have received names placing them in different genera, the most distinct are given here, retaining the above as the type, for which synonyms are as under.

Lamaria punctulata. Kze. *Linnæa*, 10.507; Pappe and Rawson, 28; Hk. and Bkr. *Syn. Fil.* 179.

Blechnum punctulatum. Sw.; Schl. *Adum.* 37, tab. 21 and 22, fig. 2; Kuhn, *Fil. Afr.* 93.

Lomaria densa. Kaulf. *en.* 151.

Lomaria auriculata. Desv.

Lomaria australis. Lowe, *Fil. IV.*, Pl. 57-58.

Lomaria pumila. Kaulf. (not *L. pumila*, Kze., and P. and R., nor *L. pumila*, Raoul; Hk. and Bkr).

Lady Barkly includes here *L. inflexa*, Kze., in mistake.

South Africa ; growing in damp parts of the forest, or among shaded rocks. Said by Lady Barkly to be common throughout South Africa, but I have not found it in Kaffraria, and in almost every collection it is more or less confused with *Blechnum australe*, L.

West.—Table Mountain, Devil's Mountain, Dutoitskloof, &c.

East.—Van Staaden's River (Browning, Bolus 1720), Grahamstown, abundant ; Krakakamma.

Kaff.—Omsamculo (Drège).

Natal.—Palmiet to Drakensberg, common (Buch.).

Var. *ATHERSTONI*. (P. & R.)

Plate LIV. Natural size.

Similar in all respects to the type, except that the fertile frond is not contracted, but less cordate at the base than the barren, while the sori lie parallel with and close to the mid-rib, in a continuous straight line in the upper pinnæ, but broken into short, oval, but parallel, distinct sori in the lower pinnæ (as in *Doodia*). If this could be maintained as a distinct species, it would belong to *Blechnum* rather than *Lomaria*.

Pappe and Rawson founded their *Blechnum Atherstoni* on the Grahamstown plant, but do not mention the sori further than the generic character of *Blechnum*, and I have doubts as to whether this keeps distinct from the next form, which also grows in Fern Kloof, Grahamstown. Buchanan, who had frequent opportunity of seeing this in its native habitat, says—"Regarded at Kew as only a *Blechnoid* variety of *Lom. punctulata*, Kze., but retained by Kuhn as a distinct species ; and we are inclined to agree with him. There is a *Blechnoid* form of *L. punctulata*, resembling the normal plant in size and texture, and *Scolopendrium Krebsii* is not much different in these respects ; whereas this plant is large and coarse, of quite coriaceous texture, and indistinct venation, with very tough stipes. It has often a creeping rhizome. The sori are usually quite *Blechnoid* in the upper part of the frond ; in the middle and lower parts where the sori gradually draw away from

the rachis to the tips of the pinnæ, the inner portion of the fructification is broken up into small dots somewhat as in *Doodia*. But in all cases the sori lie close to the mid-rib; never as in *Scol. Krebsii* midway towards or near to the margin. Its habitat is never like the latter and *L. punctulata* in wet places, but usually the comparatively dry upper margins of bush."

Lomaria punctulata. Kze., var. *Atherstoni*, mihi.

Blechnum Atherstoni. Pappe and Rawson, 16; Hk. Sp. Fil. III. 31.62; Buchanan, No. 49.

East.—Grahamstown Kloofs.

Kaff.—Bazija (Baur. 460; alt., 3000 feet).

Natal.—Inanda, Great Noodsberg, Umpumulo, Karkloof (Buchanan).

Var. *INTERMEDIA*. Mihi.

Plate LV. Natural size.

Plant similar to the type or stronger. Fertile pinnæ similar to the barren, or slightly narrower, crenulated, and more drawn to a point, but not contracted as in *Lomaria*. Sori contiguous in an interrupted line along the mid-rib, and close to it, but not parallel with it; each indusium one to two lines long, starting from the mid-rib in a slightly oblique direction, and meeting a shorter one, which also rises from the mid-rib, but in an opposite direction. The line therefore takes the appearance of a saw edge, quite sharp in the lower pinnæ, but more undulating in the upper pinnæ. Besides this there are frequently small, detached sori outside this line, and running obliquely toward the edge of the frond as in *Asplenium*, or sometimes the two meeting sori of the main line are continued outward face to face as in *Scolopendrium*. This is a most curious and evidently variable form, growing in the Grahamstown Kloofs, and also sent by Buchanan from Natal.

Var. *KREBSII*. (Kze.) Mihi.

Plate LVI. Natural size. b. Fertile part, magnified.

Fertile frond similar to the barren, both with pinnæ three inches long, four lines broad, more or less crenate, with a wider cordate base, or auricled on one or both sides. Sori halfway

between the mid-rib and the edge, attached to the veins, the two from different veins meeting face to face, as in *Scolopendrium*, and when mature forming one rounded, or oval, oblique sorus. Wood remarks—"An examination of some of the immature fronds will show that while the whole of the sori near the base of the frond are at an acute angle with the rachis, at the apex they become almost parallel with it, and are single and not double as at the base. Different forms are found, at last completely merging in true *punctulata*." Wood also mentions a bi-pinnate or bi-pinnatifid form.

Lomaria punctulata. Kze., var. *Krebsii*, mihi.

Onychium Krebsii. Kze. *Linnaea*, 10.504.

Scolopendrium Krebsii. Kze. *Linnaea*, 18.119; Suppl. to Schk. Fil., tab. 74; Bot. Mag. pl. 4768; Wood *Natal Ferns*, 17; Buchanan's list, No. 46A; Pappe and Rawson, 24.

Blechnum punctulatum. Sw., var. *Scolopendrioides*, Mett. Msc.; Kuhn, Fil. Afr. 93.

East.—Amos Kloof, Grahamstown.

Natal.—Between Omfondi and Tugela Rivers (Gueinzus); from Patillo's through Inanda and Noodsberg to Umpumulo, 1500 to 2500 feet (Buchanan).

62. LOMARIA PROCERA. Sprengel.

Plate LVII. a. Small barren frond, natural size. b. Fertile frond, natural size.

Rhizome procumbent, four to six inches long, two to three inches diameter, paleaceous, with short, broad, ovate pointed, dark scales. Frond simply pinnate, herbaceous, or thinly coriaceous, broadest at the base, one to two feet long, six to ten inches broad, with stipe twelve to eighteen inches long, which is very paleaceous below, and more or less scaly and channelled above, and on the rachis. Pinnæ of barren frond five to eight lines broad, three to five inches long, pointed, entire, or minutely serrate, not tapering to the base, but suddenly rounded to a very short petiole, even the upper ones not adnate. They are set obliquely across the rachis so that the lower edge of each pinna overlaps the upper edge of the one below it, and are sometimes

glabrous ; sometimes set with woolly shag on one or both surfaces, especially when young ; or sometimes they have ovate pointed, white scales along the mid-rib on the under surface only. Fertile pinnæ four to five inches long, two to three lines broad, pointed, flat on the upper surface, and with a marginal line extending beyond the indusium, which is membranaceous and much torn, or with each piece fringed. Veins conspicuous.

Sometimes the pinnæ of the barren frond are auricled at the base, and Kunze mentions a variety in which the pinnæ are cut toward the point.

Lomaria procera. Sprengel ; Hk. and Bkr. Syn. Fil. 179.

Osmunda capensis. Linn. Sp. 7760 (not Presl.).

Onoclea capensis. Thunb. Prod. 171 ; flora cap. 731.

Lomaria capensis. Willd. ; Kunze, Linnæa, 10.505 ; Pappe and Rawson, 27.

Blechnum capense. Schl. Adum. 34, tab. 18.

Tropics and southward ; widely spread ; often growing in full sunshine.

West.—Below Table and Devil's Mountains, Paradise, Paarlberg, &c.

East.—Van Staaden's River (Browning), Albany, Bedford, &c.

Kaff.—Frequent by streams in bush or above it, not under 3000 feet.

Natal.—Many places in the midlands.

63. LOMARIA BORYANA. Willd.

Plate LVIII. a. Plant, much reduced. b. Barren frond, reduced.

c. Scale from crown. d. Fertile frond reduced. e. Fertile pinna, nat. size.

Stem stout, tree-like, erect, two to three feet long, three to nine inches diameter, densely clothed with linear, dark brown scales, one to two inches long, half-line broad. Fronds simply pinnate, thick and coriaceous, abundant, the barren fronds more or less spreading ; the fertile produced annually in the centre and more upright in habit. Barren fronds one to three feet long, six to nine inches broad at the middle, ovate-lanceolate, and generally with shorter pinnæ toward the base ; glabrous on the upper surface except when young, but with scattered, brown, downy

shag on the under surface and rachis, though this sometimes disappears with age. Pinnæ lanceolate, or ovate-lanceolate, entire, narrowed to the base, or stalked, or the upper surface more or less adnate. Fertile fronds rather longer, with thick linear pinnæ, fertile throughout, or often partly barren in the lower pinnæ. Involucre slightly within the margin, white, membranaceous, much cut, but at first entire. Rachis channelled. Stipe six to twelve inches long, very paleaceous at the base. This fine fern is easily distinguished by its stout stem and long scales.

L. Dalgairnsiæ, P. and R., is this, with the upper pinnæ more confluent.

L. cycadoides, P. and R., has the lower pinnæ auricled, and though maintained as a species by Kuhn, grows among the ordinary form, and ranges into it.

Lomaria Boryana. Willd.; Kze. Linn. 10.505; 13.152; Pappe and

Rawson, 27; Hk. and Bkr. Syn. Fil. 180.

Onoclea Boryana. Sw.; Schk. 98, tab. 105.

Blechnum Boryanum. Schl. Adum. 35, tab. 19.

Blechnum tabulare. Kuhn, Fil. Afr. 94.

Pteris tabularis. Thunb. Prod. 171; fl. cap. 732; Pappe and Rawson, App. 51.

Lomaria tabularis. Mett.

Lomaria coriacea. Schrad.

Lomaria Gueinzii. Fée.

Lomaria cycadoides. Pappe and Rawson.

West Indies, South America, African Islands, and South Africa. Not rare in eastern districts, but local, and always on upper edge of the forest at 3000 to 5000 feet alt.

West.—Dutoit's Kloof (Drège), Table Mountain (Thunberg), Knysna Swellendam (Holland), George.

East.—Krakakamma, Uitenhage, Kat River (E. and Z.).

Kaff.—Transkei (Drège), Perie, Evelyn Valley, Dohne Hill, &c.

Natal.—Inanda, Noodsberg, Greytown, Botha's Hill, Umpumulo, Richmond (Buchanan). Plentiful in the midland districts near springs (Wood).

(*LOMARIA ERIOPUS*, Kze., (*Linnæa*, 13.152; 18.116) is *Strangeria paradoxa*, Moore, not a fern.

Genus XVII.—BLECHNUM. Linn.

Sori parallel with the mid-rib and the margin ; placed about half-way between them ; continuous, and with indusium opening inward.

A small genus of ferns, very similar in habit to *Lomaria*, but with the sori not marginal. *B. australe* is, however, very variable, and often answers to *Lomaria*, while in both our species the sori are frequently interrupted, as in *Doodia*. Most of the species are tropical.

Synopsis of the species :—

64. *B. australe*. Rachis and frond destitute of glandular hairs.

65. *B. remotum*. Rachis and frond densely covered with very short, glandular hairs.

64. BLECHNUM AUSTRALE. Linn.

Plate LIX. a. Barren frond, nat. size. b. Fertile frond, nat. size. c. Pinna of toothed form.

Crown procumbent, paleaceous, producing many simply pinnate, lanceolate, coriaceous fronds, and a few slender, subterranean rhizomes, which produce, at a distance of six to twenty-four inches, a new crown, but with few or no fronds between. Fronds six to twenty-four inches long, one to two inches broad at the middle, and tapering very gradually to the point, and also to the base, where the pinnæ are distant, and very much reduced; the lowest often within two inches of the crown, but sometimes leaving a bare stipe of six to eight inches, which is paleaceous below, but glabrous above, and like the glabrous rachis, slightly channelled in front. Pinnæ of barren frond very various, generally one-half to one and a half inches long, three to four lines broad, oblong or widely lanceolate, often falcate, tapering to a sharp point, the upper adnate by almost their whole bases ; those in the middle of the frond sessile, but rounded to a narrow connection ; those below auricled on one or both sides, and connected by the mid-rib only ; while the reduced lower ones are triangular, and often three-pointed. Fertile pinnæ one and a-half to three lines broad,

except at the base, where the upper ones widen a little, and the lower ones are hastate auricled, and less fertile, or often quite barren. Indusium continuous, at first entire, afterwards somewhat torn; placed about half-way between the mid-rib and the edge, or in some cases near the edge; sometimes filled with capsules to near the mid-rib, but often with a space between. Often in the lower pinnæ the sori are short and separate, as in *Doodia*. Both fertile and barren pinnæ in the lower half of the frond are set across the rachis, so that the lower auricle overlaps the front, and the upper auricle the back of it. Frond quite glabrous even when young, by which it is easily distinguished from the glandular *B. remotum*. It is often confused with *Lom. punctulata*, Kze., and as both vary in their fructification from typical *Lomaria* and typical *Blechnum*, that character cannot be given. In this the frond is generally narrower, and always narrower compared with the length, pinnæ closer, more pointed, continued further down the stipe, and the rhizomes are also different.

A form occurs in which all the middle pinnæ are set along their lower edges with four to eight tooth-like lobes, similar to the auricles (fig. c.), and in the fertile frond the sori extend into these lobes.

This is a most changeable species, and when growing in bottom lands, beside a stream, assumes a luxuriant habit quite unlike the dwarf plant to be found creeping round stones on dry mountain tops. The latter is *Lomaria pumila*, Kze., but cannot be classified even as a variety, as it changes habit as soon as given suitable conditions.

Blechnum australe. Linn; Thunb. Prod. 172; Fl. Cap. 734; Schk. Fil. 103. tab. 110. B.; Schl. Adum. 38.

Lomaria pumila. Kze., Linnæa, 10.508; 23.261. Pappe and Rawson, 29; (not *L. pumila*, Kaulf.; nor *L. pumila*, Raoul.; Hk. and Bkr.).

Lomaria Drègeana. Fée.

Blechnum hastatum. Klfs.; Hk. Sp; III. 57; Lowe. Fil. IV. pl. 33. B.

South Africa and African Islands; in damp situations near to or in the forest, and among rocks up to the highest levels; not uncommon.

West.—Table Mtn., Lion's Mtn., Rondebosch, Paarlberg, &c.

East.—Bontjes River, Grahamstown, Bedford, &c.

Kaff.—Komgha (Flanagan), Bazija (Baur.), Perie, Alice, Frankfort, Dohne, &c.

Natal.—From Inanda inland (Wood), 3-5000 ft. (Buchanan).

Transvaal.—Magalisberg (Sanderson).

The toothed form has been found near Perie Mission Station, and at Greytown, Dohne, and Somerset East.

65. BLECHNUM REMOTUM. Presl.

Plate LI. Natural size. b. Fertile pinna. c. Glandular hairs.

Rhizome short, stout, procumbent, but without the slender running rhizomes of *B. australe*. Crown set with reddish lanceolate scales, and having six to eight fronds. Frond three to fifteen inches long, half to one and a half inches broad, pinnate, lanceolate, or ovate-lanceolate, narrowed gradually to both ends. Pinnæ connected with the rachis by the mid veins only, in the lower half of the frond; but in the upper half connected by the whole of their rather narrowed bases. Pinnæ oblong, abruptly pointed or mucronate, with a base rounded away below, but larger or with a lobe on the upper side. Fertile pinnæ rather narrower. Sorus about half-way between the margin and the mid vein, and with a distinct clear space between it and both. Rachis round, with a groove down the front. Scales only below the pinnæ; but the whole frond on both sides set with minute glandular hairs, especially the rachis. Texture thin, membranaceous, becoming firm with age. Veins very distinct, veinlets forked, or sometimes twice forked. Sori rather interrupted; indusium torn. This is like the small form of *B. australe*, but quite distinct. Baker writes (*Nature*, May, 1891), "*B. remotum* is a variety of the American *B. hastatum*, Kaulf, which I do not think can stand as distinct specifically from the common Cape *B. australe*." I find that in cultivation, as well as in the wild state, it keeps permanently distinct, and is easily identified when alive, though dried specimens are very much alike. I have seen no specimens except those collected by myself above Perie Mission Station; and at Evelyn

Valley, near Bailey's Grave. At the latter locality it is abundant near where *Lomaria inflexa* grows.

Genus XVIII.—*ASPLENIUM*. Linn.

Sori linear or oblong, placed obliquely between the mid-rib and the margin, and covered by an indusium. This genus includes with us all ferns (except *Blechnum* and *Actiniopteris*) which have longish sori, not marginal, but covered by an indusium. It is a very large and widely distributed genus, containing several more or less natural sub-genera, of which three or four are represented in South Africa. All our species have free veins, but a few foreign species have them anastomosing. Most of the species are very beautiful, and many of them favourites in cultivation, and easily grown. Some of the species vary excessively in cutting, and some of them even range into different sub-genera.

Synopsis of the species :—

§ Sori linear or oblong, straight, not marginal (*Eu-asplenium*, Bkr.).

† Frond simply pinnate, lanceolate, not more than two inches broad.

66. *A. Kraussii*. Frond four to six inches long, one-half to three-quarter inch broad, not proliferous, but the plant bearing separate leafless, proliferous fronds. Pinnæ sessile, sharply toothed. Rachis green, fragile.

67. *A. Sandersoni*. Frond three to six inches long, one-half to three-quarter inch broad, proliferous at the apex. Pinnæ stalked, with three to five blunt lobes. Rachis green.

68. *A. Trichomanes*. Frond four to eight inches long, half-inch broad ; pinnæ almost round, sessile, minutely toothed. Rachis black, not margined.

69. *A. ebenum*. Frond three to fifteen inches long, one-half to one and a half inches broad ; pinnæ sessile, ovate or oblong, often auricled, serrate ; rachis black, not margined. Sori several on each side of the mid-rib.

70. *A. monanthemum*. Frond one to two feet long, one-half to one and a half inches broad ; pinnæ almost sessile, rhomboidal. Sori solitary along the lower edge. Rachis black, naked.

†† Frond pinnate or two-pinnate, lanceolate, not more than three inches broad.

71. *A. erectum*. Frond one-half to two feet long, three-quarters to three inches broad ; pinnæ entire or pinnate in the different varieties. Rachis edged with green, glabrous. Sori on both sides the mid-rib.

Vars. *α. lunulatum*. Pinnæ one-half to three-quarter-inch long, crenate, blunt, rhomboidal. Frond two to three feet long, proliferous.

β. minor. Pinnæ as in var. *lunulatum*, but smaller. Frond six to nine inches high, proliferous.

γ. erectum. Pinnæ one inch long, half-inch broad, acute, deeply toothed. Frond two to three feet long, proliferous.

δ. brachyotus. Pinnæ one and a half inches long, half-inch broad, bluntly toothed, obtuse ; frond two feet long, two inches broad.

ξ. zeyheri. Pinnæ obtuse, cut below to near the mid-rib into rounded toothed lobes, deeply toothed above, not proliferous.

ζ. lobatum. Pinnæ fully pinnate, with cuneate, toothed, or lobed pinnules. Frond one to two feet long, two to four inches broad, not proliferous.

72. *A. varians*. Frond three to eight inches long, one and a half to two inches broad, two-pinnate, with flabellate, toothed, rounded pinnules. Sori in the pinnules.

73. *A. Gueinzianum*. Frond nine inches long, one and a half inches broad ; pinnæ rhomboidal, cut away below, three-quarter-inch long ; cut to a widely winged mid-rib into several flabellate, bifid lobes. Sori sub-parallel with the mid-rib.

+++ Frond pinnate (or two-pinnate in vars. of 74 and 78), lanceolate or ovate lanceolate, more than three inches broad.

74. *A. protensum*. Frond two to five feet long, two to four inches broad ; pinnæ numerous, cut halfway to the mid-rib into two-toothed blunt lobes. Rachis and mid-rib pubescent.

Var. *bi-pinnatifidum*. Pinnæ cut to the mid-rib into overlapping, rounded, serrate pinnules ; plant stronger.

75. *A. anisophyllum*. Frond herbaceous ; pinnæ twelve to twenty pairs, two to four inches long, one-half to one inch broad, bluntly toothed throughout. Sori oblong, swollen, oblique, reaching halfway to the edge.

76. *A. prionitis*. Frond herbaceous ; pinnæ eight to fourteen pairs, stalked, six inches long, one to one and a half inches broad, sharply toothed throughout. Sori linear, reaching to near the edge.

77. *A. serra*, var. *Natalense*. Frond coriaceous ; pinnæ fifteen to twenty pairs, three to five inches long, one-half to three-quarter-inch broad, very much attenuated, cut halfway into toothed lobes. Sori close to the mid-rib, and almost parallel with it.

78. *A. gemmiferum*. Frond coriaceous, simply pinnate : pinnæ six to twelve pairs, four to six inches long, one to one and a quarter inches broad, pointed, entire or crenate, or bluntly toothed. Sori oblique, linear, reaching halfway to the edge.

Var. *β. flexuosum*. Pinnæ cut halfway, or at the base more, into cuneate, flabellate, bluntly toothed, overlapping lobes. Sori irregular, or reaching the sinuses.

Var. *γ. discolor*. Pinnæ cut throughout to a widely margined mid-rib, into distant, cuneate, bifid, or flabellate pinnules. Sori marginal.

+++ Fronds tapering from a wide base, coriaceous, two to three-pinnate ; pinnules linear or cuneate ; venation sub-flabellate.

79. *A. Rawsoni*. Frond two-pinnatifid, three inches long, one and a half inches broad, pinnules and upper pinnæ roundly cuneate, crenate. Sori central on the pinnules, short.

80. *A. Adiantum-nigrum*. Frond deltoid, two to three-pinnate, glabrous, three to nine inches long, two to six inches broad ; lowest pinnæ longest. Rhizome short, stout, not creeping. Pinnules rounded, toothed.

Var. *β. obtusum*. More cut ; pinnules narrow, spathulate, and lobed, with three to five sharp, equal teeth, pointing inward.

81. *A. solidum*. Frond deltoid, three to four pinnate, six to fifteen inches long, four to seven inches broad, cut throughout into linear or narrowly cuneate lobes, with three to five sharp, divergent teeth.

82. *A. cuneatum*. Rhizome creeping ; fronds glabrous, two-pinnate, four to eight inches long, three to four inches broad ; pinnæ and pinnules rounded ; lowest pinnæ generally barren, not longer than those above them. Rachis almost naked.

Var. *β. splendens*. Pinnæ and pinnules sharp pointed, fronds one to two and a half feet high, nine inches broad, three-pinnatifid ; texture less leathery.

Var. *γ. augustatum*. Frond narrow and less cut ; upper pinnæ cuneate, or cuneate three-lobed ; lower pinnatifid into about three cuneate pinnules. Rachis slightly paleaceous.

83. *A. furcatum*. Frond two-pinnate, coriaceous, two to four inches broad, one to one and a half feet long; pinnæ and pinnules pointed, with scattered, woolly scales, on one or both sides. Rachis and stipe fibrillose.

Var. β . *tripinnatum*. Frond larger and more cut, less coriaceous, and less paleaceous. Stipe and rachis fibrillose.

84. *A. cicutarium*. Frond six to fifteen inches long, four to six inches broad, three-pinnate. Segments linear, rachis naked.

§§ Sori marginal or submarginal (*Darea*, Juss.).

(78 *A. gemmiferum*, var. γ . *discolor*.)

85. *A. Dregeanum*. Frond lanceolate, two-pinnate, six to fifteen inches long, one to one and a half inches broad. Pinnæ one-half to three-quarter inches long, half-inch broad, with five to eight linear pinnules.

86. *A. Thunbergii*. Frond lanceolate, two-pinnate, one to two feet long, three to six inches broad; pinnæ one and a half to two inches long, one-half to three-quarter inch broad, herbaceous. Segments linear, blunt, one line broad; sori submarginal.

87. *A. flaccidum*. Frond two-pinnate, coriaceous, often proliferous. Pinnæ alternate, pinnules short pointed, simple, or lower one forked or pinnatifid.

88. *A. rutæfolium*. Frond two to three-pinnate, sub-coriaceous, several pinnules forked or pinnatifid. Segments half-line broad in mature plant, broader when young and barren.

§§§ Sori short, more or less curved, often horse-shoe shaped. *Athyrium*. Roth.

89. *A. Filix-fœmina*. Crown erect. Frond two-pinnate, green; pinnæ not widened to the base; pinnules toothed, or slightly lobed.

90. *A. Schimperii*. Rhizome slender, creeping. Frond one to one and a half feet long, three to four inches broad, lanceolate, three-pinnate; pinnæ widened to the base; segments toothed.

91. *A. aspidioides*. Frond ovate-deltoid, two to four feet long, eight to fourteen inches broad, three-pinnate, with toothed segments.

66. *ASPLENIUM KRAUSII*. Moore.

Plate LX. Fig. 2. Natural size.

Crown erect, very slender, slightly paleaceous. Fronds green, herbaceous, and delicate, simply pinnate, lanceolate, four to six

inches long, one-half to three-quarter inch broad, with a fragile, green, naked stipe one to three inches long. Upper pinnæ cuneate, with three to seven sharp teeth; lower pinnæ as long as broad, nearly square, sessile, connected with the rachis at the lower corner; the lower and inner edges straight; the upper and outer edges sharply toothed; the lowest pair or pairs of pinnæ more distant, rather reduced, flabellate, and connected at the middle. Veins flabellate. Sori one to three to each pinna, alternate. Besides the ordinary fronds which are not proliferous, this species produces leafless fronds, which bend over and produce young plants at the apex. It grows among moss on stones and trees in deep shade, and often a whole mass of it is connected by these runners.

No. 63 Herb. Barkl. seems to be this species, but the proliferous fronds are wanting.

Kuhn quotes as a synonym *Aspl. dentatum*, Krauss (fil. Natal, 194; Flora, 1846, 131; Pappe and Rawson, 19), and Buchanan and Lady Barkly follow, but the description given by Pappe and Rawson applies to *A. Sandersoni*, but not to this species; while Krauss' description I have not seen. *L. dentatum*, L., is given in Hk. and Bkr. "Syn. Fil." as a distinct American species.

A. Kraussii. Moore, Index, 124; Hk. Sp. fil. III. 147, Pl. 180A; Hk. and Bkr. Syn. Fil. 195; Kuhn, Fil. Afr. 104; Wood's Natal Ferns, 19. East.—Sent from Graaffreinet by Mr. Bolus under the name of *A. Macleayi* (Lady Barkly).

Kaff.—Toise River, and Thomas Mountain, rare; and in the Transkei at Main (Mrs. Young).

Natal.—Near Byrne (Wood), Bosjesman's Rand (Dr. F. Krauss), Mooi River, Nottingham, Riet Vlei (Buchanan).

Transvaal.—(Lady Barkly).

67. *ASPLENIUM SANDERSONI*. Hk.

Plate LX. Fig. 1. Natural size.

Crown procumbent, paleaceous. Fronds one-half to three-quarter-inch broad, three to six inches long, shortly stalked, linear lanceolate, simply pinnate; pinnæ terminating abruptly both

above and below, with no terminal pinna, but the rachis often prolonged and proliferous. Rachis fragile, green, glabrous; pinnæ one-sidedly cuneate, with a short, winged stalk, from which the lower edge curves into the terminal lobe, or sometimes there is one lobe on the lower side; while on the upper side there are two or three; the inner edge nearly parallel with the rachis at about one line distant. One vein goes into each of the blunt, crenate lobes, the lower veins bearing one short sorus each.

Baker ("Annals of Botany," Aug., 1891) now states that *A. brachypterum*, and *A. Dregeanum*, Kze., are Dareoid forms of this species; but so far as I have seen they are widely separate.

A. Sandersoni. Hk. Sp. fil. 3, p. 147, pl. 179; Kuhn, Fil. Afr. 116; Hk. and Bkr. Syn. Fil. 197; Wood, Natal Ferns, 20.

A. dentatum, P. & R. (See under *A. Kraussii*).

South Africa and African Islands.

Natal.—Field's Hill (M'Ken), Umpumulo, Killiecrankie (Buchanan), Noodsberg and Inanda (Wood), Richmond (Sanderson).

Mrs. Kitton's Kaffrarian specimens, so named, belong to *A. Kraussii*, Moore.

68. ASPLENIUM TRICHOMANES. Linn.

Plate LXI. Fig. 1. Natural size.

Crowns tufted, several together, almost without scales except on the undeveloped young fronds. Frond four to eight inches long, half-inch broad, simply pinnate, sub-coriaceous, linear, lanceolate, narrowed gradually to the point, and the lower pinnæ more distant and reduced. Rachis black, shining, and glabrous; without margin, and similar to the wiry stipe, which is one to four inches in length. Pinnæ one quarter to half-inch apart, alternate or sub-opposite, sessile, rhomboid, or nearly round, two to three lines broad and long, nearly equal sided, or with the upper side rather larger. Upper pinnæ cuneate; lowest flabellate; all minutely toothed round the outer edges. Veins pinnate, sori oblong, about five to a pinna, arranged three above, two below.

A. Trichomanes. Linn. Sp. pl. 1540; Kunze, Linnæa, 13; Schk. Fil. pl. 74; Pappe and Rawson, 19; Kuhn, Fil. Afr. 118; Hk. and Bkr. Syn. Fil. 196.

Widely distributed in temperate regions, but in South Africa very rare, and generally over 4000 feet alt.

West.—Swellendam (Drège), Dutoit's Kloof (Drège).

East.—Bedford (Atherstone), Bellerne (Holland), near Graaffreinet (Bolos 577), Boschberg (MacOwan).

Kaff.—Winterberg (E. and Z.), Witbergen (Kunze).

Natal.—Mooi River only (Wood, Buchanan).

69. *ASPLENIUM EBENEUM*. Aiton.

Plate LXII. Fig. 1. Nat. size of small plant. b. Pinna.

Crown tufted or procumbent, slightly paleaceous. Frond lanceolate, three to fifteen inches long, one-half to one and a half inches broad, not proliferous, simply pinnate, tapering to the point, and with the lower pinnæ approximate and reduced; firmly herbaceous or sub-coriaceous, light-green or glaucous, with a short stipe. Stipe and rachis naked, black, and polished, not edged with green. Pinnæ sessile, and connected only by the mid-rib; ovate or oblong; two to three lines broad, one quarter to one inch long, finely serrate; rounded at the point, often cordate at the base, or auricled on the upper side; the auricle overlapping the stipe. Upper pinnæ more widely adnate, decurrent on the lower side; pinnæ where not auricled nearly equal sided, with the mid-rib near the centre. Veins pinnate, forked. Sori six to twenty to a pinna, in two lines, short, oblique.

When young or small hardly distinguishable from *A. Trichomanes*, but when both are mature and strong they are quite distinct.

A. ebenum. Ait. Hort. Kew III. 462; Kze., Linnæa, 13; Pappe and Rawson, 19; Kuhn, Fil. Afr. 101; Hk. and Bkr. Syn. Fil. 198.

America, and South Africa. In South Africa generally over 2000 feet alt.; growing on steep rocky banks, under small bush.

East.—Kraakamma (Eck.), Grahamstown (Holland), Oudeberg, 4800 feet (Bolus, 1697), Boschberg (MacOwan).

Kaff.—Katberg (Buchanan), Bazija (Baur.), Komgha (Flanagan), Perie, Greytown, Toise River, Thomas Mountain.

Natal.—Mooi River, Riet Vlei, Nottingham, Umkomas (Buchanan).

70. *ASPLENIUM MONANTHEMUM*. Linn.

Plate LXIII. Fig. 1. Natural size.

Crown sub-erect, tufted, paleaceous. Frond simply pinnate, firmly herbaceous, glabrous, lanceolate, one to two feet long, one-half to one and a half inches broad, with a brown polished rachis, on a similar naked black stipe, three to nine inches long; rachis not margined with green. Pinnæ numerous, almost sessile, quite close above, larger and more distant downward, except the lowest few, which are shorter, and a half to one inch apart. Pinnæ rhomboidal, connected at the lower corner; lower edge entire and straight, at a right angle to the rachis, one-half to three-quarter inch long, inner edge entire, nearly parallel with the rachis, two to three lines long; upper and outer edges serrate, meeting in a blunt point. Lower pinnæ somewhat auricled on the upper side; lowest few flabellate and smaller. Sori usually only one, linear, parallel with the lower edge, and near it, but opening upward; but frequently with other two or three shorter ones set obliquely across the pinna in addition. The frond is not proliferous at the apex, but on the stipe below the pinnæ an adventitious bud is often to be found.

A. monanthemum. Linn. Sp. 7814; Schl. Adum. 27; Kze. Linn. 10.515; Pappe and Rawson, 19; Kuhn, Fil. Afr. 107; Hk. and Bkr. Syn. Fil. 197.

South America, Africa, and Canary Islands; not uncommon; growing in shady places by streams in bush.

West.—Rondebosch and Kerstenbosch (Bergins), Table Mountain, Grootvadersbosch (Ecklon), Paarde Kraal, Knysna (Burchell, 5199).

East.—Kat River (Eck.), Grahamstown (MacOwan), Boschberg (Bolus, 1701), Bedford (Miss Cook).

Kaff.—Frequent along the forest range; Chumie, Perie, Frankfort, Stutterheim, Toise River, &c., and Main, Transkei (Mrs. Young).

Natal.—From Maritzburg to Drakensberg, 3000 to 5000 feet (Buchanan, Wood).

71. ASPLENIUM ERECTUM. Bory.

Plates LXII., 2, LXIV., LXV., LXVI., 1, LXVII.

Crown erect, tufted, without scales. Fronds one-half to two feet long, three-quarters to three inches broad, herbaceous, glabrous, pinnate or two-pinnate, widest at the middle, tapering very gradually to each end, and often proliferous at the apex. Rachis green or brown, with a green margin, and not hairy. Pinnæ about forty pairs, more or less one-sided, varying from entire to pinnate in different varieties. Sori numerous, oblong, oblique, in two rows. Veins pinnate, main vein near centre of the pinna. This is the most variable fern we have, and as such, the most confusing. What we here regard as varieties have been made species by different authors, and each keeps true to its character, though its surrounding conditions be changed. Still though the extremes are very dissimilar, we find in the forest every intermediate grade from one form to another all through, and do not see how they can be satisfactorily separated; indeed we find difficulty in excluding *A. varians*, Hk., from the same group.

Included above are the following, which Pappe and Rawson give in a scattered fashion as species:—*A. lunulatum*, Sw., *A. erectum*, Bory; *A. brachyotus*, Kze.; *A. Zeyheri*, P. & R.; *A. lobatum*, P. & R.; *A. gracile*, P. & R. Kuhn gives the same species, using the same names, except *A. gracile*, P. & R., which he calls *A. Pappei*, Moore, and adds *A. pulchrum*, Th. Buchanan and Wood admit only four species, *A. lunulatum*, Sw.; *A. harpeodes*, Kze.; *A. brachyotus*, Kze.; and *A. gracile*, P. & R. Hk. and Bkr. in "Syn. Fil." include all under *A. lunulatum*, Sw., mentioning *A. harpeodes*, Kze.; *A. lobatum*, P. & R.; and *A. gracile*, P. & R., as forms.

The synonymy of these forms, especially the cut forms, is very

much mixed in herbaria; and *A. varians*, Hk. and Gr., is frequently confused with them.

This species is widely distributed in one or other of its forms through the tropics, and we find the forms growing intermingled, without any localisation, though Buchanan points out that in Natal *A. lunulatum* and *A. brachyotus* grow from the coast to 3000 feet alt., while *A. harpeodes* and *A. gracile* range from 2000 to 5000 feet alt.

Varieties are as under.

Var. *α*. LUNULATUM. (Sw.) Sim.

Plate LXIV. Natural size. b. Pinnule.

Pinnæ straight and entire along the lower and inner edges, rounded at the point, not deeply toothed but crenate, a half to three-quarter-inch long, two lines broad. Frond two to three feet long, sometimes proliferous.

A. erectum, Bory, var. *lunulatum*. Sim in Kaff. Ferns, 40.

A. lunulatum. Swartz. Schrad. Jour.; Schl. Adum. 27; Kze. Linnæa, 10.514; Pappe and Rawson, 19; Wood, Natal Ferns, 20; Hk. and Bkr. Syn. Fil. 202, in part; Kuhn, Fil. Afr. 105.

A. falcatum. Thunb. Prod. 172; Fl. Cap. 734.

Frequent throughout the colony.

West.—Knysna.

East.—Uitenhage (E. and Z.), Kat River (Drège), Grahamstown (Holland), Van Staaden's River (Browning).

Kaff.—Frequent throughout the forest, Komgha (Flanagan).

Natal.—Coast to Umpumulo and Maritzburg (Buchanan).

Var. *β*. MINOR. Mihi.

Plate LXII. Fig. 2. Natural size. b. Pinna.

Pinnæ as in var. *lunulatum*, but smaller. Frond six to nine inches high, generally proliferous. Found at Dohne Hill, Kaffraria.

Var. γ . *ERECTUM*. (Bory.)

Plate LXV. Natural size, and Plate LXIV. Fig. c. Pinna.

Pinnæ pointed, deeply toothed on both upper and lower edges, except a little bit which is cut away on the lower side toward the base; the corresponding upper side enlarged, or sometimes with a distinct, toothed auricle. Frond two to three feet long, proliferous. Pinnæ one inch long, three-eighths to one half inch broad. Teeth mostly single.

A. erectum. Bory; Schl. Adum. 28, tab. 15; Kze. *Linnæa*, 10.513; Pappe and Rawson, 18; Kuhn, *Fil. Afr.* 102.

A. harpeodes. Kze. *Linn.* 18.329; Hk. and Bkr. *Syn. Fil.* 202; Wood. *Natal Ferns*, 20.

A. erectum, Bory, var. *harpeodes*. Kze. *Buchanan*, No. 57.

The most common form.

West.—Table Mountain (Rawson).

East.—Grahamstown (Holland), Bedford (Miss Cook), Krakakamma.

Kaff.—Kongha (Flanagan), Main (Mrs Young), frequent throughout the forest districts.

Natal.—Upper parts of colony common (Buchanan).

Transvaal.—Macamac (M'Lea, 12).

Var. δ . *BRACHYOTUS*. (Kunze).

Plate LXVI. Natural size.

Pinnæ larger, fewer, and more obtuse; less tapering to the point, and more cut away on the lower base than var. *erectum*. Teeth as large as in that form, but blunt, and often double. Frond tapering more quickly to a confluent apex. This form approaches some conditions of *Aspl. anisophyllum*, Kze., but is thinner in texture, has round stipe, no scales, and longer, narrower sori. Pappe and Rawson say, "Stipe as well as the rachis is downy."

A. brachyotus. Kunze, *Linnæa*, 10.512; Pappe and Rawson, 18; Buchanan's list, No. 57; Kuhn, *Fil. Afr.* 99; Wood's *Natal Ferns*, 21.

Natal.—From Coast to 3000 feet (Buchanan, Wood, Gueinzus); between the Omsamcuba and Omsamwobo (Drège).

Var. ξ . ZEYHERI. (P. & R-)

Plate LXVII. c. Pinna, natural size.

Pinnæ more obtuse than var. erectum, and less cut away at the lower base, but each blunt tooth cut near to the rachis, and the lower ones enlarged into rounded toothed lobes, cut to or near to the rachis; evidently intermediate between *A. erectum* and *A. lobatum*. Frond eighteen inches long, and two inches broad.

Aspl. Zeyheri. P. and R. 18; Kuhn, Fil. Afr. 119.

A. polymorphum. Ecklon and Zeyher, Hb.

A. erectum, Bory, var. Zeyheri. Moore's Index, 127; Sim, Kaff. Ferns, 40.

A. erectum, Bory, var. β . Kze. Linnæa, 10.513.

East.—Grahamstown (Holland), Uitenhage (Rubidge), Kat River (E. and Z.), Somerset East (Guthrie, Bolus, 1700).

Kaff.—Katberg (Buchanan), Perie, Dohne, &c.

Natal.—Lynedoch and Umpumulo (Buchanan).

Var. ζ . LOBATUM. (P. & R.) Sim.

Plate LXVII. a. Slightly reduced. b. Pinna, natural size.

Frond distinctly bi-pinnate; pinnules separate, cuneate, again toothed or lobed, with a green edged rachis. Frond one to two feet long, two to three inches broad, tapering gradually to the point, and ending rather abruptly at the base; not proliferous.

A. erectum, Bory, var. lobatum. Sim, Kaff. Ferns, 41.

A. lobatum. Pappe and Rawson, 22; Moore's Index, 141; Kuhn, Fil. Afr. 105; Hk. and Bkr. Syn. Fil. 202 (under *A. lunulatum*, Sw.).

A. gracile. Pappe and Rawson, 22.

A. Pappei. Moore's Index, 152; Kuhn, Fil. Afr. 110.

Buchanan also doubtfully places here, *A. pulchrum*, Thouars.

East.—Albany (Dr. Atherstone), Fern Kloof, Grahamstown (Holland), Tzitzikamma (Dr. Rubidge).

Kaff.—Main (Mrs. Young), frequent in the forests, Perie, Frankfort, Dohne Hill, &c.

Natal.—Abundant (Buchanan), upper districts (Wood).

72. *ASPLENIUM VARIANS*. Hk. and Gr.

Plates LXVI. Fig. 2. Natural size. LXXIII. Fig. 2. Small frond, nat. size,

Crown erect, tufted, without scales. Frond three to eight inches long, one and a-half to two inches broad, two-pinnate or two-pinnatifid, herbaceous, glabrous, broadly lanceolate, with a short fragile stipe, and a slightly margined green rachis; lower pinnæ hardly less than those above; pinnæ nearly equal sided, ovate, rounded at the point, and pinnately divided to the rachis into about six distinct, flabellate rounded, toothed pinnules, which are often cuneate at the base, with flabellate venation, and one to four sori in each pinnule. Easily recognised as a distinct form from *A. erectum*, var. *lobatum* by its small size, comparatively greater breadth of the frond, and the more rounded outline of the pinnæ and lobes, but I think it will eventually have to be merged as a variety into *A. erectum*, Bory. from which it has no good specific distinctions.

A. varians. Hk. and Gr. Ic. pl. 172; Hk. and Bkr. Syn. Fil. 216.

A. fimbriatum. Kze. Linnæa. 18.117; Pappe and Rawson, 33. Kuhn, Fil. Afr. 102; (not *A. fimbriatum*. Hk. Syn. Fil. 229.)

India and S. Africa; not growing here below 4000 ft. altitude.

East.—Bedford (Miss Cook; Holland); Boschberg (MacOwan).

Kaff.—Katberg (Buchanan), Sage's Bush, Izeli (Leighton), Komgha (Flanagan), above Perie Mission Station.

Natal.—Between Omfondi and Togela Rivers (Gueinzus), Verulam (Wood), Umpumulo, Mauritzburg, Nottingham, Cathkin (Buchanan), Great Noodsberg (McKen.)

73. *ASPLENIUM GUEINZIANUM*. Mett. MSS.

Frond firmly herbaceous, glabrous, nine inches long, one and a half inches broad, with a short green stipe which has a few ovate, membranaceous scales. Pinnæ numerous, decurrent into a petiole, rhomboid-oblong, rounded or auricled on the upper side at the base; cut away on the lower side; three-quarters of an inch long,

lower rather less, cut to a broadly winged mid-rib into two to three pairs of lobes or pinnules, of which the lower one on the upper side is separate, roundly obovate from a cuneate base, and two to three times bifid, lobes sub-flabellate, spreading, obtuse, often bifid; upper undivided. Sori one to two, sub-parallel with the mid-rib, not reaching the sinus of the lobes, and with one or two obliquely at the base of the lowest lobe.

A. Gueinzianum. Mett. MSS. ; Kuhn, Fil. Afr. 103. (with description); Hk. and Bkr. Syn. Fil. 486.

Lady Barkly adds, "originally called *A. laciniatum* by Kuhn."

Natal.—(Gueinzus). Not seen by me, and not in Kew Herbarium.

74. *ASPLENIUM PROTENSUM.* Schrad.

Plate LXVIII. Reduced. b. Pinna, nat. size.

Rhizome procumbent, short, naked, with the bases of the old stipes permanent, and thickened. Frond firmly herbaceous, pinnate or two-pinnatifid, lanceolate, tapering both ways, two to five feet long, two to four inches broad, with a channelled, pubescent rachis, and short pubescent stipe, sometimes glabrous when old. Pinnæ thirty to forty sub-opposite, spreading pairs, nearly sessile, one to one and a half inches long, half an inch broad at the base, and tapering to a longish point; often falcate, cut on both edges halfway to the mid-rib into blunt lobes of about two teeth each. The pinnæ are unequal sided, the lowest two lobes on the lower side being awanting. Sori oblong, in two rows near the rachis, somewhat oblique, one on the principal vein of each lobe, and directed toward it. This fine fern is easily distinguished from all its relations by having the rachis covered with fine glandular hairs, which sometimes extend partly on to the pinnæ. It resembles large specimens of *A. erectum*, having the same herbaceous texture, and long narrow outline; and like it often produces a bud near the point of the frond.

A. protensum. Schrad ; Schl. Adum. 29. tab. 16 ; Kze. Linnæa, 10. 513 ;
Pappe and Rawson, 18 ; Kuhn, Fil. Afr. 113 ; Hk. and Bkr. Syn. Fil.
211.

Africa and African Islands ; growing in wet places in deep shade ; frequent.

West.—Knysna (Verrriaux).

East.—Grahamstown (Holland), Boschberg (MacOwan).

Kaff.—Katberg (Miss Hartzenberg), Main (Mrs. Young), Perie, Frankfort, &c.

Natal.—Great Noodsberg and Umpumulo to Drakensberg, 2000 to 5000 feet (Buchanan).

Var. BIPINNATIFIDUM. Mihi.

Plate LXIX. Nat. size.

Plant stronger in all its parts than the type, but habit, texture, and villose rachis, as well as the cutting when the plant is young, are the same. When the plant is mature fronds are two to four feet long, five to seven inches broad, lanceolate, the pinnæ divided to the mid-rib toward the base into separate but overlapping, obovate, rounded, bluntly serrate, lobed pinnules. Upper pinnules rounded, more or less confluent. Sori flabellate in the free lobes, otherwise nearly parallel with the costa, and not reaching the sinus. Found at Dokamma, (Drège, fide Kunze), and in the Perie Forest.

75. *ASPLENIUM ANISOPHYLLUM.* Kze.

Plate LXX. Frond reduced. b. Pinna, nat. size.

Crown erect, paleaceous. Frond herbaceous, glabrous, simply pinnate, lanceolate, one and a-half to two feet long, four to six inches broad, with a green stipe one foot long, glabrous above, but paleaceous towards the base, and a somewhat winged rachis. Pinnæ twelve to twenty pairs, shortly petioled, broadly lanceolate, from a shortly cuneate base, attenuated toward the point, two to four inches long, half to one inch broad, deeply toothed throughout except the two basal edges ; the teeth mostly in pairs, and rather

obtuse. Sori short, oblong, swollen, placed near the mid-rib, and reaching only about halfway to the edge. Lower pinnæ slightly reduced. Terminal pinna rather larger than those near it, and often subtended by a bud. In some fronds the pinnæ have a long narrow point, as in fig. b. (var. *elongatum*, Kze.), in others they are shorter and more obtuse, and approach *A. erectum* var. *brachyotis*; but both can be found on one plant, and there is evidently no permanent form, though *A. Boltoni*, Hk. MSS. is founded on a deeply inciso-crenate form, and the var. *microphylla*, of Kuhn, is a small state.

A. anisophyllum. Kze. Linn. 10. 511; Pappe and Rawson, 18; Kuhn, Fil. Afr. 96; Wood's Natal Ferns, 21; Hk. and Bkr. Syn. Fil. 204.

S. America, W. Indies, and Africa south of the Equator. Among stones under trees, often where damp; frequent eastward.

East.—Kat River (E. and Z.), Grahamstown (Holland).

Kaff.—Alice, Perie, Frankfort, Dohne Hill, &c.

Natal.—Inanda to beyond Maritzburg (Wood), Umpumulo, Karkloof, Richmond (Buchanan), Fort Buckingham, Noodsberg (McKen.)

Transvaal.—Houtbosch (Dr. Rehmann, 5589).

76. *ASPLENIUM PRIONITIS*. Kunze.

Plate LXXI. Natural size.

Crown erect, paleaceous, with long black pointed scales, Frond two feet long, eight to ten inches broad, glabrous, herbaceous, simply pinnate, with a naked stipe about one foot long. Stipe and rachis green. Pinnæ eight to fourteen sub-opposite pairs; lower ones with half-inch petiole; upper more shortly stalked, all sharply toothed throughout, six inches long, one to one and a half inches broad at the base, and for three inches, then tapering to a rather elongated sharp point. Base on the upper side at a right angle to the pinna mid-rib, and slightly decurrent; lower base very oblique. Sori linear, three-quarter-inch long, reaching from near the mid-rib to near the edge, and sometimes shorter ones between and rather nearer the edge. Veins mostly

forked, with the sori on the upper line, the other barren, or with short sori near the point. Teeth sharp, mostly single, but rather irregular.

A. prionitis. Kunze, *Linnæa*, 10.511; Pappe and Rawson, 17; Kuhn, *Fil. Afr.* 112; Hk. and Bkr. *Syn. Fil.* 204.

A. obliquum. Willd. V. 315, part (*fide* Kuhn).

Eastern South Africa.

East.—Blockhouse Kloof, Grahamstown (Dr. Atherstone).

Kaff.—Manubie Forest (J. H. Bowker), Pondoland (Drège).

Natal.—Common in Coast bush (Wood), as far inland as Inanda, 1500 feet (Buchanan), Noodsberg, Inanda, Palmiet, Maritzburg (M'Ken).

77. *ASPLENIUM SERRA*, var. *NATALENSE.* Baker.

Plate LXXII. Natural size.

Crown erect, paleaceous. Frond coriaceous, glabrous, two feet long, six to eight inches broad, ovate, simply pinnate, with a stipe twelve inches long, which is naked above, and scaly at the base. Pinnæ fifteen to twenty pairs, shortly stalked, alternate or sub-opposite, three to five inches long, one-half to three-quarter-inch broad at the base, and tapering to a long attenuated narrow point. Pinnæ unequally wedge-shaped at the base, cut halfway to the rachis or less into oblong or rounded sharply toothed lobes, the lower lobe on the upper side larger and sub-flabellate. Sori two to three lines long, almost contiguous, in two lines parallel to the rachis, and quite close to it, or slightly oblique.

A. serra, Langs. and Fisch., var. *Natalense.* Baker *Syn. Fil.* 485; Buchanan's list, No. 62; Lady Barkly's list, No. 71.

A. serra. Wood's Natal Ferns, 22.

A. serra is a South American species, and this variety is its South African representative.

Natal.—Under the drip of water in bush at southern terminus of Great Noodsberg only (Buchanan); in two ravines at Little Noodsberg and at Inanda (Wood).

78. *ASPLENIUM GEMMIFERUM*. Schr.

Plate LXXIII. Fig. 1. Frond reduced. b. Pinna, natural size.
Varieties on Plates LXXIV. and LXXV.

Crown erect, paleaceous, with long, narrow, laciniated, black scales. Frond thick, sub-coriaceous, simply pinnate, glabrous, ovate-lanceolate, two to four feet long, six to eight inches broad, with a channelled green stipe one foot long. Pinnæ six to twelve pairs, shortly stalked, alternate, or sub-opposite, falcate, four to six inches long, one to one and a quarter inches broad for most of the length, then drawn to an acute point; lower edge sloping very gradually to the petiole; the upper edge rounded suddenly down at the base to the petiole. Edge entire, or with shallow crenations, or very bluntly toothed. Terminal pinna similar, but rather larger, often with a bud at the base; lower pinnæ not reduced. Sori linear, oblique, four lines long, extending rather more than halfway to the edge.

This is a most beautiful fern, massive and heavy in the type, though lighter in the varieties. Schlechtendal's figure (Adum. pl. 14A) is more toothed, and more sharply toothed than often occurs.

A. gemmiferum. Schrader, Goett. Gel. Anz. 1818, 916; Kze. Linnæa, 10.510; Pappe and Rawson, 17; Hk. and Bkr. Syn. Fil. 207.

A. lucidum. Schl. Adum. 25, tab. 14A.

Africa and African Islands south of the equator; growing in wet ground in the forest; not common.

West.—Hangklip (Mund and Maire), Knysna (Burchell, 5405), Swellendam (Holland), Voorman's Bosch (Rawson).

East.—Tzitzikamma (P. and R.), Grahamstown (Atherstone), Boschberg (MacOwan).

Kaff.—Kongha (Flanagan), Thaba N'doda, Perie, Frankfort, Toise River, &c.

Natal.—Upper districts, as low as Inanda (Wood), Umpumulo, Maritzburg, Richmond (Buchanan).

Var. β . *FLEXUOSUM*. Schrad.

Plate LXXIV. Natural size.

This has frequently fronds similar to the ordinary form of

A. gemmiferum, or rather more toothed, and with the teeth in pairs, but other fronds on the same plants have the pinnæ cut halfway to the rachis into irregular, bifid, four-toothed, overlapping lobes, or toward the base cut nearly to the rachis into overlapping, cuneate, flabellate pinnules, toothed on the outer edge; teeth blunt, in pairs. Sori very irregular, generally extending from near the mid-rib to the base of the sinus, or with shorter ones up in the lobes. Adventitious buds occur irregularly on the upper surface of the frond; often several on a frond.

This form is not very permanent, and consequently not satisfactorily distinct from *A. gemmiferum*, appearing intermediate between it and var. *discolor*, though no further gradation in that direction has been seen. Schlechtendal's tab. 14, fig. b, belongs to this species though named *A. lucidum*, Forst. var.

A. flexuosum. Schrad. Schl. Adum. 29; Pappe and Rawson App. No. 3.; Hk. and Bkr. Syn. Fil. 208.

Knysna (Holland), Grahamstown (Dr. Atherstone).

Kaff.—Komgha (Flanagan), Perie, rare.

Var. γ . DISCOLOR.

Plate LXXV. Natural size.

Habit similar to *A. gemmiferum* but smaller; frond not exceeding two feet, with a black or greenish-black rachis and stipe, and gemmiferous below the terminal pinna. Pinnæ cut throughout to a widely margined rachis into distant cuneate pinnules one to two lines broad at the base, two to five lines broad above, glaucous on the under surface. Upper pinnules two-toothed, lower bifid, and with each lobe two-toothed, or the lower one on the upper side even more divided or flabellate, pinnatifid. Sori two to three lines long, almost marginal, extending along the upper base of a pinnule from near the mid-rib; sometimes also there are short marginal sori along the sinus which divides the pinnule into two lobes. This is a very distinct form, and I have seen no gradation toward var. *flexuosum*. If none such occur it

ought to stand as a species, and be placed in section *Darea*, near *A. flaccidum*, Forst.

This appears from specimens in Cape Town and Grahamstown Herbaria to be *Aspl. discolor*, P. and R. 17, where, however, *A. lucidum*, Schl. Adum., tab. 14, fig. 6, is quoted, which is our var. *flexuosum*; while *A. flexuosum*, Schr., is placed among the unknown species in the appendix. Wood's var. *flexuosum* is allied, and *A. gemmiferum*, Schr., var. *laciniatum*, mett., is made by Kuhn to include both this and var. *flexuosum*.

West. = Knysna (Miss Dalgairns), Seven Oaks (Holland).

East.—Grahamstown (Atherstone), Brookhuizen's Poort (MacOwan), Kat River (E. and Z.).

Kaff.—Katberg.

Natal.—Seven-mile bush, Upper Umkomaas, 4000 feet, and Inanda (Wood).

79. *ASPLENIUM RAWSONI*. Baker.

Plate LXXVIII. Natural size.

Crown tufted, slightly paleaceous. Frond deltoid, glabrous, simply pinnate, two-pinnatifid or two-pinnate, three inches long, one and a half inches broad, with a slender green channelled stipe three inches long, paleaceous only at the base, with small brown scales. Pinnæ about four sub-opposite pairs; upper pinnæ nearly round or slightly cuneate, shortly stalked, three to five lines long and broad, thinly coriaceous, crenate at the outer rounded margin; lower pair of pinnæ larger, more or less lobed, or cut nearly or quite to the mid-rib into round lobes. Sori short, occupying the centre of the pinnule, and leaving a wide space outside. Veins distinctly flabellate.

This is named *A. Ruta-muraria*, Linn., in Pappe and Rawson's Synopsis, but the specimens I have seen are quite distinct from that species, and also from *A. cuneatum*, Lam., which it approaches.

A. Rawsoni. Baker, Journ. Bot. 1872, p. 362; Hk. and Bkr. Syn. Fil. 487; Lady Barkly's list, No. 76.

A. *Ruta-muraria*. Pappe and Rawson, quoted by Kuhn, Fil. Afr. 115 (not A. *Ruta-muraria*, L.).

Top of Muizenberg Mountains, in crevices of rocks (Hon. R. W. Rawson, 1857).

Lady Barkly adds that only one plant was found, and further search has proved vain.

80. ASPLENIUM ADIANTUM-NIGRUM. Linn.

Plate LXIII. Fig. 2. Small frond, natural size. b. Pinnule of var. *obtusum*.

Crown procumbent, short, slightly branched, glabrous, or slightly paleaceous, thickened by the enlarged basis of decayed fronds. Fronds deltoid, coriaceous, glabrous, two to three-pinnate, varying from three inches long and two broad to nine inches long and six broad, with numerous, alternate, or sub-opposite pinnæ, and a dark, naked, furrowed stipe, one to six inches long, swollen into a fleshy base below. Lower pinnæ largest, deltoid, stalked, one to three inches long, one to one and a half inches broad; in large fronds two-pinnatifid, with three to four pairs of distant, stalked, deltoid, pinnatifid, toothed pinnules, one inch long, half-inch broad; in small fronds, only the lower pinnules separate, roundly ovate, lobed and toothed, with upper pinnules close, rounded, confluent, and upper pinnæ also confluent. Pinnæ with a broad point, and rounded at the apex; lobes and pinnules broadly rounded, all sharply toothed, but with the teeth short and not divergent. Sori abundant, one to one and a half lines long, in two rows in each lobe or pinnule, slightly oblique, and reaching halfway from the centre to the edge, afterwards confluent in one long mass of capsules.

A. *Adiantum-nigrum*. Linn.; Schl. Adum. 31, tab. 17; Pappe and Rawson, 21; Moore's Index, 109; Hk. and Bkr. Syn. Fil. 214; Kuhn, Fil. Afr. 95.

A. *tabulari*. Schrad. Gött. Anz. 1818, 916.

A. *argutum*. Kaulf. enum. 176.

Europe, Asia, Africa, and African Islands. In South Africa local and not common ; growing on rocky banks.

West.—Table Mountain, Grootvader's Bosch (Rawson), Devil's Mountain, Dutoitskloof (Kunze).

East.—Grahamstown (Holland), Graaffreinet (Bolus, 206), Winterhock (M'Lea), Boschberg (MacOwan).

Kaff.—Thabase (Baur), Komgha (Flanagan), Dohne, Cathcart, Alice.

Natal.—Midland and upper districts (Wood), Umpumulo, Greytown, Maritzburg, Mooi River, Riet Vlei (Buchanan).

Var. β . OBTUSUM. (Willd.)

Plate LXIII. Fig. 2. b. Pinnule.

Generally a stronger growing form than the type, rather more cut, with narrow, spathulate, and lobed pinnules, and with three to five sharp, but not divergent, equal teeth on each lobe. This form approaches *A. solidum*, Kze., which may also be a more altered form of *A. Adiantum-nigrum*, as another further grade appears in *A. acutum*, Bory.

In the fine series of European specimens of this group in Herb. Gub., the more rounded form appears as *A. Adiantum-nigrum*, L., and our var. *obtusum* as *A. serpentinae*, Tausch, but *A. solidum* is not represented.

Schlechtendal gives two forms of *A. Adiantum-nigrum*, the one representing our type, and the other is described as being *A. acutum*, Bory, but the figures are both of the type, and almost alike except in size.

A. Adiantum-nigrum, L., var. γ . *obtusum*. Hk. and Bkr. Syn. Fil. 216.

A. obtusum. Willd.

A. serpentinae. Tausch, Jour. of Botany, May 1864.

Moore also mentions as synonyms here—

A. Adiantum-nigrum, *capense*, of Schimp. Hb. Abys.

A. Fosteri. Sadl.

81. *ASPLENIUM SOLIDUM*. Kunze.

Plate LXXVI. Natural size. b. Fertile pinnule.

Crown procumbent, glabrous. Fronds deltoid, coriaceous, glabrous, shining, green, three to four-pinnatifid, six to fifteen inches long, four to seven inches broad, with a channelled, green or brown naked stipe, four to six inches long. Pinnæ mostly alternate, numerous, stalked, deltoid, sharp pointed, increasing in size downward; the lowest three to four inches long, one and a half inches broad, with about five pairs of alternate, shortly stalked, deltoid pinnules, one-half to one inch apart. Pinnules cut to the mid-rib below, into narrowly cuneate, three-lobed segments, which have three to five sharp pointed divergent teeth on each lobe. Upper segments narrower, not lobed, slightly confluent, but similarly toothed; and the pinnule pointed, with a few large alternate simple teeth. Sori one to two lines long, alternate, and near the mid-rib above, or two to three in each pinnule below.

Kunze mentions two varieties, *A. platyphyllum* and *A. stenophyllum*. The latter is the form in our figure, the former is slightly broader in all its parts, and while evidently a form of *A. solidum*, it also comes very near *A. Adiantum-nigrum*, L., var. *acutum*, which, like this, has three to five long teeth with the central one longest, and which is well known as a European plant, and quoted in "Moore's Index" as from South Africa, though this is the only representative of it I have seen. *A. solidum* resembles a *Darea* in the cutting, but has the sori facing inward, and not quite marginal.

A. solidum. Kze. *Linnaea*, 10.520; Pappe and Rawson, 21; Moore's Index, 169; Kuhn, *Fil. Afr.* 116; Hk. and Bkr. *Syn. Fil.* 214.

Darea mucronata. De Cand. *Hb.*

This species grows under bushes, mostly among coast sands, and is rather rare.

West.—George (Lady Barkly), Ruigte Valley (Drège).

East.—Algoa Bay (Forbes), Bushman's River (Holland), Kowiemouth (MacOwan).

Kaff.—Alice (Dr. Stewart), Komgha (Flanagan).
Natal.—Near Peel's, Umlaas (M'Ken).

82. *ASPLENIUM CUNEATUM*. Lam.

Plate LXXVII. Fig. 1. Natural size.

Rhizome subterranean, slender, creeping, paleaceous. Fronds deltoid, glabrous, sub-coriaceous, two-pinnate, four to eight inches long, three to four inches broad, on a wiry, green or brown stipe, six inches long, scaly below only. Pinnæ shortly stalked, deltoid, blunt, with four to six obtuse, rounded or lobed, distinct pinnules, which are cuneate at the base, and sharply serrate round the outer edge. Lower pinnæ generally not longer than those above them. Sori numerous, flabellate, mostly short, often wanting from the lower pinnæ. Veins very numerous, conspicuous.

A. cuneatum, Lam. enc. II. 309; Pappe and Rawson, 20; Kunze, *Linnaea*, 10.516; Kuhn, *Fil. Afr.* 100; Hk. and Bkr. *Syn. Fil.* 214.

Central America, Polynesia, South Africa, and African Islands. This form, which is not so common as var. *splendens*, grows on rocks away from the present forest range, but which most likely had been under forest at some previous time.

East.—Somerset East (MacOwan), Grahamstown (Dr. Atherstone).

Kaff.—Izeli, and near Peddie.

Natal.—Nearly everywhere in bush from Palmiet to Nottingham (Buchanan, Wood; but both include var. *splendens* here).

Var. β . *SPLENDENS*. (Kze.)

Plate LXXVII. Fig. 2. Pinna, natural size.

Larger in all its parts than the type. Fronds three-pinnatifid, often two feet long, nine inches broad, and with a stipe nine inches long. Pinnæ three to four inches long, one and a half to two inches broad, pointed, or sometimes with an attenuated point, and about four pairs of pinnules, also pointed more or less; the lower ones larger, and cut nearly to the mid-rib into roundly cuneate

lobes. The texture is less leathery than in the type, and occasionally it has a few scattered ovate scales on the stipe and rachis. This form is everywhere in the forest, and cannot be regarded as other than a conditional form.

A. splendens. Kze. *Linnæa*, 10.516; Pappe and Rawson, 21; Moore's Index, 169; Kuhn, *Fil. Afr.* 117; Hk. and Bkr. *Syn. Fil.*, Ed. II., 487.

A. splendens, Kze., var. *elongatum.* Kze. *Linn.* 10.516.

East.—Karakamma (E. and Z.), Grahamstown (Holland).

Kaff.—Kat River (E. and Z.), Komgha (Flanagan), Pondoland (Drège), St. John's River (Sir H. Barkly); abundant in Perie, Frankfort, Stutterheim, Toise River, &c.

Natal.—Not distinguished from *A. cuneatum* by Natal botanists.

Var. γ . *ANGUSTATUM.* Mihi.

Plate LXXVIII. Fig. 2. Natural size.

Fronde proportionally narrower and less cut than in *A. cuneatum*, coriaceous, glabrous, two to two and a half inches broad, twelve to fifteen inches long, including a stipe of six inches. Pinnæ about eight sub-opposite pairs, of which the upper are cuneate or cuneate three-lobed; lower stalked, deltoid, pinnatifid into about three cuneate pinnules, of which the terminal is longest, lobed, and pointed, and the others rounded. Outer edges all crenate-serrate; cuneate sides entire. Rachis more or less paleaceous, with dark, lanceolate, hard, deciduous scales. Frond without scales except on the short petioles. Sori half-inch long, three to six in a pinnule, and like the conspicuous veins, flabellate. This approaches the smaller woolly form of *A. furcatum*, Thbg., in general outline, but is less cut, less pointed, and almost naked, and evidently belongs to *A. cuneatum*. Found by Lady Barkly at Knysna, and named by her *Asplenium dimidiatum*, Swartz.

83. *ASPLENIUM FURCATUM.* Thunb.

Plate LXXIX. Natural size.

Rhizome procumbent on the surface, three to six inches long,

densely set with longish, dark brown, linear, shining scales. Frond two-pinnate, coriaceous, ovate-lanceolate, two to four inches broad, one to one and a half feet long, with about twelve pairs of sub-opposite or alternate pinnæ, and a stipe of six inches. Pinnæ deltoid, pointed, shortly stalked, cut nearly or quite to the rachis into four to six cuneate pinnules; the lower distinct and flabellate or trifid, the others oblong pointed, and slightly confluent; all with the upper margin sharply toothed, and tapering to a point. Sori two to three lines long, flabellate or central in the pinnules, and in two lines close to, and nearly parallel with the mid-rib in the upper part of the pinnæ, facing inward. Stipe and rachis nearly black, abundantly set with rusty brown, fibrillose scales, which increase in size downward. Pinnæ also set more or less thickly on both sides with scattered brown woolly scales.

A. furcatum. Thunb. Prod. 172; Fl. Cap. 735; Schl. Adum. 30; Hk. and Bkr. Syn. Fil. 214.

A. præmorsum. Sw. Prod. 130; Kze. Linnæa, 10.519; Pappe and Rawson, 19; Kuhn, Fil. Afr. 111.

A. furcatum (including both forms) grows through most of the tropics. Here, var. *tripinnatum* is the more common plant; growing abundantly in forest districts, and some of the localities quoted below may belong to that form. The less divided form grows on exposed rocks, and though very different in the extremes they cannot be separated, as every intermediate gradation between the two occurs. A minute, simply pinnate, scaly form, three to four inches high, grows on a rock near Bollasi, King William's Town.

West.—Table Mountain, Rondesbosch (Bergins), Paarlberg (Kunze).

East.—Uitenhage (Krauss), Algoa Bay (Forbes), Bedford (Miss Cook), Krakakamma, Zwartkop.

Kaff.—Dohne Hill, Tamache, Bollasi, &c.

Natal.—Plentiful in upper districts (Wood), Maritzburg and Umpumulo to Drakensberg (Buchanan).

Transvaal.—Magalisberg (Sanderson).

Var. *TRIPINNATUM*. Baker.

Plate LXXX. Natural size.

Larger and more cut throughout than the type, also less coriaceous, and less paleaceous. Frond five to nine inches broad, one and a half to two and a half feet long, with a stipe six to nine inches long, three-pinnatifid. Pinnæ shortly stalked, deltoid, one and a half inches broad, three to four inches long, with woolly scales on the lower side only. Pinnules distinct, deltoid, shortly stalked, pinnately cut to the mid-rib into five to seven cuneate, or flabellate, three-lobed, toothed pinnules. The stipe and rachis are abundantly fibrillose, and the channelled, slightly margined, rachises of the pinnæ, and the under side of the pinnæ, are also more or less fibrillose, but the upper surface is generally almost naked and shining. In deep shade it is sometimes nearly destitute of scales throughout, and quite herbaceous in texture; but is then easily distinguished from *A. cuneatum* by its more numerous and proportionally shorter pinnæ, and also by the lower pinnæ being rather less than those at the middle of the frond.

A. furcatum, Thunb., var. *tripinnatum*. Bkr. Syn. Fil. 487; Wood, Ferns of Natal, 23.

A. furcatum, Thb., var. *tripinnatifidum*. Sim, Kaff. Ferns, 45.

A. laserpitiifolium. M'Ken, Natal Ferns, No. 59.

A. furcatum. P. and R. 20.

Localities have not formerly been recorded for this as separate from *A. furcatum*, but it is the more common form, and possibly some quoted for the species belong to this var.

East.—Grahamstown (Dr. Atherstone), Boschberg (MacOwan).

Kaff.—Komgha (Flanagan), Main (Mrs. Young), and through all the Amatolla forests.

Natal.—Noodsberg (Wood), Van Reenan's Pass, Drakensberg (Dr. Rehmann, 7217), Nottingham (Buchanan), Peel's on the Umlaas (M'Ken).

(*ASPLENIUM BULBIFERUM*. Forst.

This well-known fern is credited in Hk. and Bkr. "Syn. Fil."

to Natal, but Buchanan thinks it is a mistake, while Kuhn, M'Ken, and Wood all omit it. There are no specimens in the South African Herbaria, and it seems likely that the locality is a mistake, though not deleted in the 2nd Edition, nor in the more recent revision in "Annals of Botany.")

84. *ASPLENIUM CICUTARIUM*. Sw.

Plate CXLVII. Natural size.

Fronde eighteen inches long, six inches broad at the middle, rather less below, tapering to a fine point, and having a naked stipe of six inches. Pinnæ about twenty pairs, alternate, or the lower sub-opposite, spreading; those on one side an inch apart at the middle; the lower more distant and reduced; the upper much closer and gradually smaller. Mid-pinnæ lanceolate, three inches long, three-quarter-inch broad at the base, sessile, with a slender rachis, and ten to twelve pairs of alternate, deltoid, shortly stalked pinnules, half-inch long, three to four lines broad, which again are cut to the mid-rib into two to three pairs of alternate segments, of which the upper are linear-oblong, pointed, one line long, half-line broad; and the lower are broader, flabellately two to three lobed, and narrowed to the base. The lower segment on the upper side is nearer the pinna rachis than that on the lower side, and the pinnule is thus unequal sided. Sori on the veins; one near the base of each simple segment, and opening toward the point of the pinnule; two to three face to face on the flabellate segments, short, frequently curved, and not reaching near the margin. Frond glabrous, quite destitute of scales, and thinly herbaceous in texture. Rachis slender, brown, slightly green, margined. A most graceful fern found in tropical America and Africa. The original South African specimen was sent by Sanderson from Magalisberg, Transvaal, and no other has since been recorded. My description and figure are from specimens from the Cameroon Mountains, kindly forwarded to me from Kew, and which Mr. Baker informs me are very like Sanderson's specimen. It is var. *Abyssinicum* (A. *Abyssinicum*, Fèe), distinguished from the type

by rather broader segments and more flaccid fronds. In Hk. and Bkr. "Syn. Fil.," 1st Edition, *A. rhizophyllum*, Kunze, is also credited as sent by Sanderson from Natal; but in 2nd Edition this locality is omitted, and Lady Barkly and Buchanan both trace it to his *A. cicutarium*.

A. cicutarium. Sw.; Hk. and Bkr. Syn. Fil. 220; Kuhn, Fil. Afr. 99.

85. *ASPLENIUM DREGEANUM*. Kze.

Plate LXXXI. Natural size.

Crown erect, tufted, slightly paleaceous, with brown scales, or almost naked. Fronds herbaceous, glabrous, tender, lanceolate, acuminate, six to fifteen inches long, one to one and a half inches broad, with a slender green rachis, and a stipe three inches long. The frond produces a proliferous bud below the terminal pinnule, and has fifteen to thirty pairs of shortly stalked pinnæ, one-half to three-quarter-inch long, half-inch broad, cut to the mid-rib into one to three pairs of simple linear pinnules, besides the lower one on the upper side, which is often bifid or trifid, and which has no corresponding pinnule on the lower side. The pinnules or lobes are one to two lines long, and a half-line or less broad, with the sori marginal or intramarginal along its upper edge. Lower pinnæ gradually reduced to half the size of middle ones.

A. brachypterum, Kze., differs only in being smaller, and is merged in *Dregeanum* by Kuhn, while Baker ("Annals of Botany," Aug. 1891) now says that "*A. brachypterum* and *Dregeanum*, Kze., are Dareoid forms of *A. Sandersoni*, Hk." If these can be connected, I do not see why *A. Thunbergii*, Kze., should not be held to belong to the same group of forms, under one broken species.

A. Dregeanum. Kze. Linn. 10.517; Suppl. to Schk. Fil., tab. 27; Pappe and Rawson, 22; Kuhn, Fil. Afr. 101; Hk. and Bkr. Syn. Fil. 221.

A. brachypterum. Kze. Linn. 23.232; Hk. and Bkr. Syn. Fil. 221
Wood, Natal Ferns, 23.

Africa and African Islands ; growing in deep shady ravines.

Kaff.—Omzambaba (Drège).

Natal.—Abundant at Umpumulo, 2000 to 3000 feet (Buch.), Inanda, Maritzburg, and midland districts (Wood).

86. *ASPLENIUM THUNBERGII*. Kunze.

Plate LXXXII. Natural size.

Crown erect, tufted. Frond herbaceous, glabrous, widely lanceolate, one to two feet long, three to six inches broad, with a green, herbaceous, flattened, glabrous rachis, and a naked, channelled stipe, six inches long. Frond proliferous below the terminal pinnule. Pinnæ twenty to thirty pairs, one and a half to two and a half inches long, one-half to three-quarter-inch broad at the base, and tapering to a rather blunt point, cut uniformly to the broadly winged mid-rib into eight to twelve pairs of regular, close, bluntly oblong, simple pinnules, one line broad, one to three lines long ; the lower pinnule on the upper side broader, sub-flabellate, 2-3-4-fid, or pinnatifid. Sori oblong on the upper side of the vein but not marginal ; mid-rib together with its wings one line broad. Pinnæ longest at the middle of the frond. Baker suggests that it may be a Dareoid form of *A. erectum*, while Pappe and Rawson and Wood remark on its growing in company with *A. Dregeanum*, to which it is closely related. Kunze mentions a form with falcate pinnæ.

Asplenium Thunbergii. Kze. Linn. 10.517 ; Pappe and Rawson, 22 ;

Hk. and Bkr. Syn. Fil. 223 ; Wood, Natal Ferns, 23.

Asplenium auriculatum. Kuhn, Fil. Afr. 97.

Cænopteris auriculata. Thunb. Nov. Act. Petrop. 1791.

Darea auriculata. Willd ; Schl. Adum. 32.

Natal only ; near streamlets in bush, Great Noodsberg, Inanda, Maritzburg (M'Ken). Abundant at Umpumulo, 2000 to 3000 feet (Buch.). Cape of Good Hope (Thunberg).

87. *ASPLENIUM FLACCIDUM*. Forst.

Plate LXXXIII. Nat. size. b. Fertile pinnule, enlarged.

Crown erect, tufted, naked or almost so. Frond firmly coria-

ceous, glaucous, glabrous, one and a half feet long, including stipe of six inches. Pinnæ six pairs, linear acuminate, alternate, three to four inches long, one line broad at the sinuses and point, about four lines broad across the segments. Pinnules acute, one line broad and long, somewhat decurrent. Terminal pinna four inches long, with longer pinnules and sori than the others; lower pinnæ barren, not pinnatifid, but waved at the margin. Rachis and stipe slightly winged, wing disappearing below. Sori short, marginal on the upper margin of the pinnules, opening outward. The above description, as well as our figure, are from Sanderson's specimen in Herb. Gub.; but the plant often grows stronger abroad, with fronds two to three feet long, and with numerous, flaccid, coriaceous pinnæ, half-inch broad, and six inches long, cut into regular, linear or forked, pointed pinnules, three lines long, one line broad, and having one line between each; the lowest pinnule on the upper side longer, and again pinnatifid. Adventitious buds are produced irregularly on the upper surface of the frond. This is another of Sanderson's finds which has not been seen since.

Buchanan remarks—"It seems to be a mistake. Mr. Sanderson knows nothing of it, and Kuhn positively denies it to be a South African plant (Fil. Afr. 203)." However, as explained elsewhere, Sanderson sent home up-country specimens without keeping notes or duplicates, and this may have been among them. The specimen in Herb. Gub. is distinctly *A. flaccidum*, but it does not have Sanderson's label, nor any explanation of how it came there, though attributed to Sanderson.

A. odontites, R. Br. (*Cænopteris*, Thunb., P. and R.; *Darea*, Willd., Schl. Adum. 32), recorded as found by Thunberg at the Cape, seems to be the same plant, but the locality is denied by Kuhn.

88. ASPLENIUM RUTÆFOLIUM. Kunze.

Plate LXXXIV. Fig. 1. Frond of young plant, natural size. Fig. 2. Fertile frond of mature plant, natural size. b. Fertile segment.

c. Section of stipe, and Plate LXX. Fig. 2. Frond reduced and pinna, natural size.

Crown erect, paleaceous, with numerous, lanceolate, dark scales. Frond two to three-pinnate, deep green, firmly herbaceous, or sub-coriaceous, glabrous, ovate lanceolate, one-half to one and a half feet long, two to six inches broad, with a channelled, green, naked rachis, and a similar stipe three to six inches long. Pinnæ ten to twenty alternate or sub-opposite pairs, deltoid or deltoid acuminate, often all fertile except the lower two pairs, which are then shorter, and not so much cut as the others, but frequently whole fronds are barren when they are different from the fertile. Barren pinnæ blunt, cut to near the mid-rib into several cuneate, flabellate, deeply lobed pinnules, above which are bifid, and then simple pinnules, more or less confluent. Fertile pinnæ longer, cut throughout into distinct, separate, pointed pinnules, of which the upper are simple, gradually longer downward, then bifid and trifid, and with the lower pinnules ranging from flabellately three to five-lobed to fully pinnate, with three to four pairs of linear, or sometimes bifid, pointed segments. All the pinnules or segments, as well as the rachis of the pinna, are about a half-line broad, and consist of a thickly margined vein only. Sori one to three lines long, marginal along the inner face of each segment, or in partly fertile fronds sometimes intramarginal. The lower pinnules on the upper side of the pinnæ are parallel with the rachis, and sometimes very noticeable when much larger than the others, but with no corresponding pinnule on the lower side. This is a most variable plant, and has been made into several species; but there is every possible gradation, and even permanent forms cannot be selected.

Cænopteris furcata, Bergins (*Asplenium stans*, Kze.) is the small plant growing on trees, in which the pinnules are all simple, or the lower only bifid.

A frond in Albany Museum marked var. β . is two and a half feet long, one foot broad at the middle, very unlike the ordinary form, and more nearly approaching *A. flaccidum* except in texture. It has pinnæ six inches long, one inch broad at the base, and

tapering to a point, only the lower pinnules six to seven lobed, the next bifid, then simple, distant, linear lobes. The two lowest pinnæ are different, two inches long, one inch broad, and like usual barren lower pinnæ of *A. rutæfolium*. But even this curious form is connected with *A. rutæfolium* by as large a frond in Natal Govt. Herb., which is similar in all respects, except that three to four of the lowest pinnules are pinnate. The lowest one on the upper side is parallel with the rachis, and the others point outward. The texture is as in the common form.

In habit, habitat, cutting, &c., the simpler forms of *A. rutæfolium* and *Davallia concinna*, Schr., are very much alike, and Kuhn places the latter in *Asplenium*, where it would stand next to this species, and be distinguished by the shorter and more terminal sori.

A. rutæfolium. Kze. 10.521; Pappe and Rawson, 23; Hk. and Bkr. Syn. Fil. 222; Kuhn, Fil. Afr. 115.

Cænopteris rutæfolia. Bergins, Act. Petr. VI. 249; Thunb. Prod. 172; Flora Cap. 734.

Darea rutæfolia. J. Smith, Willd., Schl. Adum. 33.

Asplenium stans. Kze. Linnæa, 10.521; Pappe and Rawson, 23.

Darea stans. Bory.

Cænopteris furcata. Bergins, Act. Petr. 1778, VI., 248.

Darea furcata. J. Smith; Schl. Adum. 33.

South Africa and South Asia. One of our most common ferns throughout the Colony and Natal, easily cultivated, and known as the Carrot Fern.

Transvaal.—Houtbosch (Dr. Rehmann, 5584).

89. ASPLENIUM FILIX-FÆMINA. Bernh.

Plate LXXXV. Natural size. b. Fertile pinnules.

Crown erect, abundantly paleaceous. Frond herbaceous, glabrous, one and a half to two feet long, six to eight inches broad at the middle, rather less below, and with an almost naked rachis, and a stipe six inches long, which has abundant, very long, narrow, brownish scales below, suddenly decreasing in size and

number upward. Pinnæ alternate, lanceolate, acuminate, three to four inches long, three-quarters to one inch broad, not increasing in width at the base, cut throughout into regular ovate-oblong, oblique pinnules, three to four lines long, one and a half to two lines broad, which are finely toothed, or slightly lobed below. Sori several on a pinnule, very short, varying from straight to nearly crescent shaped.

An almost cosmopolitan species, which in Europe has broken into innumerable varieties, some of which are very distinct and permanent. What in Africa are known as *A. Filix-fœmina*, Bernh.; *A. Schimper*, Br.; and *A. aspidioides*, Schl., are closely connected forms, which if well known in growth in nature would most likely be found to be inseparable as species, but the two former being rare, and mostly known from a few dried specimens, they must still be retained.

The specimens from which our figure and the above description are taken were found by Buchanan on the top of the Drakensberg, and are preserved in the Government Herbaria in Cape Town and Natal. Wood quotes from Buchanan—"Very like *A. Schimper*, but cut somewhat more finely, without any pink tint in its rachis, and with a perfectly upright rhizome."

Lady Barkly claims to have found it in Basutoland, but the specimens in her collection are *A. aspidioides*.

"It grows in the full blaze of the sun, and away from water, in the margin of the bush on the heights above Karkloof and Riet Vlei, Natal." (Buchanan.)

90. *ASPLENIUM SCHIMPERI*. A. Br.

Plate LXXXVI. Natural size. b. Fertile pinnule, enlarged.

Rhizome wide-creeping, slender, with long brown scales. Frond firmly herbaceous ovate-lanceolate, pointed, three to four inches broad, one to one and a half feet long, and with a stout pink-tinted stipe, six inches long, which is paleaceous at the base, but nearly naked above; pinnæ deltoid, pointed widest at the base, one to two inches long, one inch broad, with six to ten pairs

of distinct, deltoid, or ovate oblong pinnules. Pinnules cut to the mid-rib into four to six pairs of oblong toothed segments, somewhat confluent above. Sori longish, curved above; lower pinnae considerably reduced, and more distant.

Asplenium Schimperi. A. Br. in Schweinf. Beitr. 224; Wood, Natal Ferns, 24; Buchanan's list, No. 75; Kuhn, Fil. Afr. 116; Hk. and Bkr. Syn. Fil. 489.

Tropical Africa, extending to Natal, where it grows about exposed but damp rocks, in Nottingham and Karkloof districts, and in bush at Cathkin, 4000 to 5000 feet alt.; also at Umpumulo, 2500 feet (Buchanan).

91. *ASPLENIUM ASPIDIOIDES*. Schl.

Plate LXXXVII. Nat. size.

Crown sub-erect, paleaceous. Frond herbaceous, tender, glabrous, ovate or ovate-deltoid, two to four feet long, eight to fourteen inches broad, with a green, slightly scaly stipe, six to twelve inches long. Pinnæ ovate lanceolate, six to ten inches long, one and a half to three inches broad, with attenuated points, and with ten to twenty bluntly ovate-deltoid pinnules, which are cut to the rachis into five to ten pairs of rounded, oblong, toothed segments. Sori oblong, curved, generally one to each segment.

This species varies considerably in size, and Schlechtendal's figure shows a pinna twelve inches long, four inches broad, and more distinctly cut than most specimens.

Asplenium aspidioides. Schl. Adum. 24, tab. 13; Kunze, Linnæa, 18.118; Pappe and Rawson, 21; Kuhn, Fil. Afr. 97; Hk. and Bkr. Syn. Fil. 228; Wood, Natal Ferns, 24.

Athyrium laxum. Pappe and Rawson, 16; Moore's Index, 186; Kuhn, Fil. Afr. 105.

Aspidium scandicium. Willd.

India, African Islands, and South Africa.

Natal.—In wet shady places from Inanda inland (Wood), Umpumulo, Karkloof, Kranzkop, Noodsberg, Richmond, Maritzburg (Buchanan), Fort Nottingham (M'Ken).

Basutoland.—(Sir H. Barkly).

Fuller's Kloof near Woest Hills.—(Holland).

(Buchanan mentions (Revised List, p. 30) — “A large *Asplenium*, apparently near to *A. polypodioides*, if not a variety of it,” as sent by Mr. Ayres from Macamac gold fields, Transvaal.

A. polypodioides, Mett., is a large, pinnate, East Indian fern, with a short tree-like stem, and belongs to the section *Diplazium*, in which the sori extend to both sides of the veins. *Diplazium* is not otherwise represented in South Africa, and Mr. Baker writes that *A. polypodioides* is not known at Kew from this district, so having seen no specimen, I can only mention it here.)

Genus XIX.—*ACTINIOPTERIS*. Link.

Fronde flabellate, with narrow, radiating, simple or once forked segments. Sori linear, submarginal, one on each side the segment, opening face to face. This genus includes only the one distinct and curious little plant described below, and the list of synonyms shows that it has undergone a variety of generic names.

92. *ACTINIOPTERIS RADIATA*. Link.

Plate CVII. Fig. 2. Natural size. c. Section of pinnule, enlarged.

Crown sub-erect, tufted, with abundant, lanceolate, brown scales. Frond coriaceous, fan-shaped, one to two inches broad, divided to near the base into four to six divergent pinnules, which are again divided into two to three linear, spreading segments, half-line broad, toothed at the blunt apex. Stipe one to six inches long, slightly edged with green, and having scattered spreading scales. Fertile segments longer, narrower, and more pointed. Sori linear, submarginal on each side of the segments, covered by a thin indusium opening inward. It seems to vary considerably

in size, as some plants have fronds six inches high with as many as twenty-five segments one inch long, while other fronds on same plants are only one inch high with quarter-inch long segments. Other specimens have similar medium-sized fronds, but along with them stronger fronds, divided into about sixteen segments three inches long. A specimen in Herb. Gub. has on a three-inch stipe a frond of nine linear segments, three to four inches long, and one line broad, the fertile infolded, not toothed at the tip, but sharp pointed. That form is *Acrostichum australe*, Linn.

Actiniopteris radiata. Link. Sp. 79; Hk. and Bkr. Syn. Fil. 246.

Blechnum radiatum. Presl. tab. 103; Pappe and Rawson, 16.

Acrostichum dichotomum. Forsk, fl. œq. Arab. (oldest name).

Pteris dichotoma. Kuhn, Fil. Afr. 79.

Acrostichum radiatum. Koenig.

Asplenium radiatum. Sw.; Kze. Linnæa, 24.259.

South Asia, and throughout Africa, south to Transvaal.

Transvaal.—Magalisberg (Burke and Zeyher, 532; Todd, Zeyher, No. 1874); Limpopo (H. M. Barber); near Eurika City in the Sheba Mountains, Barberton (Dr. C. M. Vowell, 1888).

Griqualand.—(R. Moffatt).

Matebeleland.—Devil's Kantour, Tati (J. Fry, 1887).

Bechuanaland.—Kuruman (Rev. J. Brown).

Genus XX.—*DIDYMOCHLÆNA*. Desv.

Sori reniform or elongated, attached along its centre to the intramarginal raised end of a vein, which forms a linear elevated receptacle, and covered by a reniform or elliptical indusium, attached along its length to the vein, and free all round the edges and upper end, but emarginate at the base. This genus consists of only two species, distinguished from *Aspidium* and *Nephrodium* by its elongated receptacle.

93. *DIDYMOCHLÆNA LUNULATA*. Desv.

Plate LXXXVIII. Natural size.

Stem erect, sub-arborescent, paleaceous. Frond coriaceous, two-pinnate, three to five feet long, one to two feet broad, with

rachis and stipe very paleaceous, with laciniated scales half-inch long. Secondary rachises also scaly. Pinnæ lanceolate, one and a half to two inches broad, with numerous, approximate, one-sided pinnules, three-quarters to one inch long, three to five lines broad at the base, shortly stalked at the lower corner; inner edge parallel with the rachis, entire; upper edge and the rounded end toothed. Pinnules jointed to the rachis; veins sub-flabellate. Sori as described for the genus. A curious plant somewhat resembling some of the *Adiantums* in the form of its pinnules.

D. lunulata. Desv. Ann. Linn. VI. 282; Kze. Fil. I. 203; Wood, Natal Ferns, 24; Hk. and Bkr. Syn. Fil. 248.

D. dimidiata. Kze. Linnæa, 18. 122; Pappe and Rawson, 15.

D. lunulata, Desv., var. *dimidiata*. Kuhn, Fil. Afr. 157.

Aspidium truncatulum. Sw. Willd.

Tropical America, East Indies, Africa, and African islands.

Natal.—Moist places in bush; midland districts, Inanda inland (Wood), Maritzburg, Umpumulo, 2000 to 3000 feet (Buchanan), near Togela River (Gueinzus).

Genus XXI.—ASPIDIUM. R. Br.

Sori round, with a central stalk supporting the circular peltate indusium, which covers the capsules. This is a large and widely distributed genus, containing several natural groups of diverse habit, and closely connected with *Nephrodium*, but distinguished by the orbicular indusium.

Synopsis of the species.

§ Veins free (*Polystichum* Roth.).

94. *A. aculeatum*, var. *pungens*. Two-pinnate or casually three-pinnatifid. Pinnæ lanceolate, not increasing in breadth at the base; scales brown.

95. *A. luctuosum*. Two-pinnate or casually three-pinnatifid. Pinnæ lanceolate, increasing in breadth to the base; scales long, nearly black.

96. *A. capense*. Frond three-pinnate or four-pinnatifid ; lower pinnæ deltoid ; teeth rounded, not bristle pointed.
97. *A. aristatum*. Frond four-pinnatifid, lower pinnæ deltoid ; teeth bristle pointed.
98. *A. Macleaii*. Frond simply pinnate, coriaceous ; sori in regular lines, or somewhat scattered.

§§ Veins anastomosing (*Cyrtomium*, Presl.).

99. *A. falcatum*. Frond simply pinnate ; sori scattered.

94. *ASPIDIUM ACULEATUM*, Sw., var. *PUNGENS*. Klf.

Plate LXXXIX, Natural size.

Crown procumbent, abundantly paleaceous, elongating into a thick rhizome several inches long, set all round with the stipes of decayed fronds, from whose bases roots are freely given off. Fronds two-pinnate or sometimes casually three-pinnatifid, firmly herbaceous, or sub-coriaceous, varying from one to four feet long, five to twelve inches broad ; rather less or deflexed below, and with a stout stipe six to twelve inches long, which is abundantly paleaceous, with large, pointed, lacinate, brown scales at the base, and set with shorter, brown or red, woolly, scarious scales upward and throughout the rachis and secondary rachises. Pinnæ three to six inches long, lanceolate, about an equal breadth (three-quarters to one inch) for half the distance from the base to the point, then tapering. Pinnules sessile or shortly stalked, numerous, one-sided, sharp-pointed, toothed on the upper and outer edges with bristle-pointed teeth, or cut more or less into toothed lobes. Sori small, numerous. The pinnules differ very much in form, position, cutting, &c., in different forms, but intermediate varieties are to be found all through. The same plant in shade and in sun, or under a stone and on a stone, shows most of the variations that occur, and they cannot be separated nor perpetuated.

Buchanan, Wood, and Lady Barkly introduce *A. aculeatum*, Sw., as distinct from *A. pungens* ; and Pappe and Rawson so introduce *P. angulare* ; but except these are all founded on *A. luctuosum*, I fail to find the two. The distinguishing character

is said to be the running rhizome of *A. pungens*, whereas *A. aculeatum* has a sub-erect crown, and that *A. pungens* is less scaly; but all our forms have the crown or rhizome procumbent, and in favourable conditions running; while in quantity of scales they are alike, and even Schlechtendal's figure shows scales to near the point of the frond. Among the numerous specimens named *A. pungens* in the various Cape Herbaria, none show rhizome or crown, but all are large, forest grown fronds. If this rhizome-producing form is specifically distinct from the almost cosmopolitan *A. aculeatum*, Sw., then we have *A. pungens* only, and not *A. aculeatum*; but I think them too close, and have put our plant as *A. aculeatum*, Sw., var. *pungens*, and do not find typical *A. aculeatum* in South Africa.

The most distinct form is one with compact, narrow, upright fronds, which grows round stones and on steep banks near the top of the mountains, often in great masses; but that also has the creeping rhizome, and merges gradually into the other where it is beside bush. This form is evidently what Buchanan considered *A. aculeatum*, while the bush-grown plant was his *A. pungens*.

Aspidium pungens. Klfs. en. 242; Schl. Adum. 21, tab. 10; Kze.

Linnæa, 13; Lowe Fil. VI., tab. 8; Hk. and Bkr. Syn. Fil. 252;

Buchanan, 18; Wood, Natal Ferns, 25; Kuhn, Fil. Afr. 140.

Polystichum pungens. Presl.; Pappe and Rawson, 14.

Polystichum angulare, Pappe and Rawson, 15 (not Willd).

Aspidium aculeatum. Buchanan's List, 18; Lady Barkly's List, No. 95;

Wood, Natal Ferns, 25; Sim, Kaff. Ferns, 46.

Polypodium aculeatum. Thunb. Prod. 172; Flor. Cap. 735.

Aspidium capense. Desv. Ann. Linn. VI. 250 (not *A. capense*, Willd).

Abundant in bush everywhere over 2000 feet alt.

95. *ASPIDIUM LUCTUOSUM*. Kunze.

Plate XC. Natural size.

Crown procumbent or sub-erect, very scaly, with large, ovate, pointed, black scales. Frond coriaceous, two-pinnate or three-pinnatifid, two to three feet long, six to ten inches broad at the

base, and with a stout stipe nine to fifteen inches long, which is abundantly paleaceous below, and more or less clothed upward, as are also the rachis and frond, with fibrillose black scales or hairs. The fronds, and also the pinnæ, taper gradually and regularly from a broad base to the rather attenuated tip. Pinnæ sub-opposite, one to one and a half inches broad at the base lowest pinnule on the upper side larger than others, parallel with the rachis, and often deeply pinnatifid or pinnate; other pinnules lobed or sharp toothed, and with a bristle point directed upward. Sori small, very abundant.

This is quite a distinct species, and does not vary at all; always growing beside streams in deep shade, and often in company with *A. aculeatum*, var. *pungens*, but without any intermediates.

Aspidium luctuosum. Kze. *Linnaea*, 10. 548; Buchanan's List, No. 79.

Polystichum luctuosum. Pappe and Rawson, 14; Moore's Index, 95.

Aspidium aculeatum, Sw., var. *luctuosum*, Hk. and Bkr. Syn. Fil. 252; Wood, Natal Ferns, 25; Lady Barkly's List, No. 95.

South Africa only; nowhere common.

East.—Bedford (Atherstone), Boschberg (MacOwan).

Kaff.—Phillipstown (E. and Z.), Katberg (Holland), Perie Mission Station, Sage's Bush, Frankfort, &c.

Natal.—Maritzburg and Nottingham, 3000 to 4000 feet alt. (Buchanan), upper districts (Wood).

96. *ASPIDIUM CAPENSE*. Willd.

Plate XCI. Lower pinnæ, nat. size.

Rhizome creeping, six to eighteen inches long, one inch diameter, often epiphytal on trees, shaggy, with long yellow scales. Fronds deltoid, rather distant, coriaceous, three-pinnate, one to three feet long, one to two feet broad, and with a stout stipe, which is densely paleaceous below, and with scattered ovate scales upward. Lower pinnæ largest, deltoid, stalked; with stalked,

deltoid, secondary pinnæ, which are cut below to the mid-rib into ovate, blunt, bluntly toothed, or lobed, glabrous pinnules, which are confluent above. Sori very large, generally numerous.

Aspidium capense. Willd, Hk. and Bkr. Syn. Fil. 254 (not *A. capense*, Desv.).

Polypodium capense. Linn. Suppl. 445 ; Thunb. Fl. Cap. 735.

Aspidium coriaceum. Swartz. Prod. 133 ; Schl. Adum. 21 ; Schk. filic., tab. 50 ; Kunze, Linnæa, 13 ; Kuhn, Fil. Afr. 128.

Polypodium coriaceum. Sw.

Polystichum coriaceum. Schott.; Moore's Index ; Pappe and Rawson, 15.

Tropics and sub-tropics, south of the equator ; epiphytal on trees, in large clumps, and also growing on the ground about stones, in sunshine.

West.—Swellendam, Grenadendal (Kunze), Rondebosch (Bergins), Knysna.

East.—Van Staaden's River, Krakakamma, Grahamstown (Holland), Boschberg (MacOwan), Uitenhage, &c.

Kaff.—Komgha (Flanagan) ; common throughout the forest district.

Natal.—From Inanda inland (Wood), Maritzburg, Noodsberg, Inchanga (M'Ken), Itafamasi, Umpumulo, rare (Buchanan).

97. *ASPIDIUM ARISTATUM*. Sw.

Plate XCII. Natural size.

Rhizome creeping, paleaceous. Frond sub-coriaceous, or firmly herbaceous, glabrous, deltoid, three-pinnate or four-pinnatifid, one and a half to two feet long, one foot broad, with stipe twelve inches long, set below with narrow scales. Lowest pinnæ much the largest, and with pinnæ largest on the lower side, unequally deltoid ; other pinnæ less cut, lanceolate from a wide base. Pinnules ovate-cuneate, sharp pointed, and with pointed teeth, or toothed lobes. Sori small, abundant. This resembles *A. capense* in outline, but is sharply toothed, with smaller sori, and is less coriaceous. In some herbaria it is confused with *Neph. Filix-mas*, var. *elongatum*.

Aspidium aristatum. Swartz.; Hk. and Bkr. Syn. Fil. 255; Kuhn, Fil. Afr. 209; Buchanan's List, No. 82 (where M'Ken's *A. frondosum* is said to be a mistake).

Asia, Australia, and South Africa; beside streamlets in bush.

Kaff.—Katberg (Holland), Bazija (Baur.).

Natal.—Maritzburg, sources of the Umlaas, Nottingham, Karkloof (Buchanan).

Transvaal.—Macamac gold fields (J. H. M'Lea, No. 7).

98. *ASPIDIUM MACLEAHII*. Baker (in Hook. Icon. Plant, Nov. 1886, tab. 1654).

Plate XCIII. Nat. size. b. Scale from crown.

Crown erect, densely paleaceous, with large, widely lanceolate, lacinated, thin, brown scales. Frond coriaceous, leathery, simply pinnate, widely lanceolate, glabrous on the upper surface, two to three feet long, one foot broad, with a stout stipe one foot long, which is densely set with large scales at the base, and with smaller more fibrillose scales upward. Rachis also fibrillose, and the under side of the pinnæ more or less so. Pinnæ in thirty to fifty opposite pairs, approximate, almost sessile, lanceolate acuminate, half-inch broad, six inches long; lower ones rather shorter, all deeply and sharply toothed throughout; cut away at the base on the lower side, but with a toothed lobe or auricle on the upper side. Veins free; one group for each tooth. Sori small, in a single line near to the mid-rib, or more frequently scattered in three or four irregular lines, or with scattered sori out on the lobes, the outer ones always smaller.

Baker's figure, especially the magnified one, shows the lobes rounded, with five to six almost equal teeth, but in the fronds I have seen most of the lobes are single large sharp teeth, while toward the base of the pinnæ the lobes or auricles are sharp pointed, with a few small teeth along the edges. The auricle is sometimes cut quite to the rachis, and occasionally three to four lobes are so, and then slightly stalked. This is a very distinct plant.

Transkei.—Bazija (Rev. R. Baur; MacOwan).

Transvaal.—Wetkloofs, Pilgrim's Rest, Drakensberg (J. H. M'Lea, No. 34; Herb. Bolus. 3030), Macamac (Ayres, Buchanan's List, No. 3, page 30).

99. *ASPIDIUM FALCATUM*. Swartz.

Plate XCIV. Frond reduced. b. Pinna, nat. size.

Crown erect, abundantly paleaceous, with large, black, pointed scales. Fronds coriaceous, glabrous, shining, dark green, simply pinnate, two feet long, six to eight inches broad, and with a stout stipe six to nine inches long, with numerous large scales at the base. Pinnæ six to ten pairs, sub-opposite, shortly stalked, widely lanceolate, or ovate, with a falcate, acuminate point; the base often unequal, the lower side being cut away and the upper side rounded. Margin finely toothed, or nearly entire. Veins anastomosing into a regular network. Sori abundant, irregular, half-line diameter.

Aspidium falcatum. Swartz.; Hk. and Bkr. Syn. Fil. 257; Wood, Natal Ferns, 26.

Cyrtomium falcatum. Presl., Pappe and Rawson, 15.

Aspidium anomophyllum. Zenk. pl. ind.; Kunze, Linnæa, 24.277; Kuhn, Fil. Afr. 125.

South Asia and South Africa; growing in deep shade.

East.—Boschberg (Guthrie, MacOwan).

Kaff.—Katberg (Holland), near Tyumie (F. H. Ely), Pontz' Bush, Izeli, 3500 feet.

Natal.—Nottingham to Drakensberg (M'Ken), Umpumulo, rare, Riet Vlei, Cathkin, 3500 feet (Buchanan), Maritzburg (Wood).

Transvaal.—Macamac (M'Lea, No. 6).

Genus XXII.—*NEPHRODIUM*. Rich.

Sori roundish or reniform, with a reniform indusium attached by its sinus. This is a large genus, closely connected with *Aspidium*, and in some cases not very satisfactorily distinct where

the indusium is somewhat intermediate in character. From *Nephrolepis* the general habit and articulated pinnæ of the latter furnish a distinction ; while in *Oleandra* the habit itself is distinctive. From *Polypodium* there is the general distinction that the latter has no involucre ; but in some *Nephrodiums* it is fugacious, and in others it is generally present but sometimes absent, or abortive, and when this is the case they are not distinguishable from *Polypodium*.

The genus is divided by Hooker and Baker into sub-genera, in which our species are distributed as under.

§ *Lastrea*. Presl. Veins all free. 100, 101, 105, 106, 107, 108, 109, 110, 111.

§§ *Eu-nephrodium*. Lower veinlets of contiguous groups united. 102, 103, 104.

§§§ *Sagenia*. Presl. Veins anastomosing freely, 112.

There is nothing natural in the above arrangement, and even as an artificial arrangement it has been repeatedly broken through, as almost every South African botanist has confused *N. Bergianum* with *N. molle* and *N. Mauritianum*, and on this account it is not used here.

Synopsis of the species.

§ Fronds two-pinnatifid. Veins free, or those from neighbouring pinnules meeting.

100. *N. albopunctatum*. Rhizome long, slender. Sori mostly one to each pinnule. Veins free, simple.

101. *N. Bergianum*. Rhizome short, with sub-erect crown. Sori numerous in the pinnules. Veins free, simple ; texture thin.

102. *N. mauritianum*. Pinnules not close ; texture thin. Veins simple ; two or more pairs of veinlets from neighbouring pinnæ meeting.

103. *N. molle*. Pinnules close or over-lapping ; texture firmly herbaceous. Veins simple ; several lower pairs from neighbouring pinnæ meeting.

104. *N. unitum*. Texture coriaceous, nearly glabrous, several pairs of veinlets from neighbouring pinnæ meeting.

105. *N. Thelypteris*. Veins free, forked.

§§ Frond three-pinnatifid, or more cut. Veins free.

106. *N. Filix-mas*, var. *elongatum*. Lower pinnæ larger than those above, with sharply toothed pinnules. Frond triangular, herbaceous.

107. *N. inæquale*. Lower pinnæ not larger than those above: Frond ovate lanceolate, herbaceous; pinnules sharply toothed.

108. *N. athamanticum*. Frond widest below, sub-coriaceous, and with bluntly toothed pinnules.

109. *N. Buchanani*. Frond three-pinnate, deltoid, herbaceous, with the rachises set with spreading hair-like scales.

110. *N. catopteron*. Frond three-pinnate, very large, villose on both surfaces, and with villose stipe and rachises. Indusium villose.

111. *N. crenatum*. Frond three-pinnatifid, deltoid, small. Crown clothed in red scales. Indusium reniform, but unequal sided, bristly.

§§§ Frond two-pinnatifid or two-pinnate. Veins anastomosing freely.

112. *N. cicutarium*. Frond sub-deltoid.

100. *NEPHRODIUM ALBO-PUNCTATUM*. Desv.

Plate XCV. Natural size. b. Fertile pinnules, enlarged.

Rhizome long, creeping, slender, fibrillose. Frond herbaceous, ovate-lanceolate, two-pinnatifid, strongly and pleasantly scented, minutely pubescent on one or both surfaces, twelve to eighteen inches long, six inches broad, with a short pubescent stipe, which is articulated to the rhizome. Middle pinnæ one-half to three-quarter inches broad, and about four inches long; lower pinnæ rather shorter, all sessile, lanceolate acuminate, cut to very near the mid-rib into blunt oblong pinnules, all entire except the lower ones, which are slightly toothed. Sori mostly in the upper part of the frond, one to each pinnule, terminal on the lower veinlet on the upper side. The pinnæ have a line of white dots near the margin on the upper surface, from which the name has originated.

Nephrodium albo-punctatum. Desv. Ann. Linn. VI. 255; Hooker and Baker Syn. Fil. 264; Wood, Natal Ferns, 27.

Aspidium albo-punctatum. Bory; Willd., Kuhn, Fil. Afr. 124.

Lastrea albo-punctata. Presl., Moore's Index.

Aspidium leucosticton. Kze., *Linnaea*, 23.301.

Arthropteris. J. Smith.

Polypodium pectinatum. Forsk.

Tropical Africa, and African Islands.

Natal.—Open rocks about two miles west of the Inanda, and immediately below Insusi Fall, only 2000 feet alt. (Buchanan), (Govt. Herb. Cape Town and Natal, and Herb. Bolus, 3974).

(*NEPHRODIUM CONTERMINUM.* Desv.)

A Natal fern, without or almost without indusium, which in Hk. and Bkr. Syn. Fil. stands as *POLYPODIUM OBTUSILOBUM*, Desv., had been stated formerly by Baker to belong to one of the forms of *N. conterminum*, and on this is included in Lady Barkly's list under that name ; but it is likely that Mr Baker used that name in the wide sense of the *conterminum* group, as used in his "Synopsis Filicum," which includes *N. Bergianum*, Baker. At all events, Lady Barkly's specimens from Buchanan, and all the other specimens I have seen so named, or named *Polypodium obtusilobum*, are identical with the larger growing forms of *N. Bergianum*, and do not answer so well to Baker's restricted species *N. conterminum*, Desv., and Mr. Baker writes me that he does not know *N. conterminum* from South Africa. The only difference from *N. Bergianum* is that they have no indusium, and even that is a poor distinction, as in almost every case the specimens are in the advanced condition in which the more or less fugacious indusium is often wanting, or can be seen only with difficulty. *N. Bergianum* is however often without indusium, or almost so, even when young ; and Schlechtendal founded thereon his *Polypodium Bergianum* (Adum. p. 20, tab. 9), in which he was followed by Kunze, and by Pappe and Rawson ; though Kunze remarks that this and his *N. patens* grow in company.

Though Schlechtendal describes and figures his plant as having no indusium, *Nephrodium Bergianum*, Baker, which has generally an indusium, is named from it, with *Polypodium*, Schl., as

synonym ; while the plant without indusium is placed under *P. obtusilobum*, Desv. Buchanan, on what he calls a common plant, remarks—"In the last edition of 'Syn. Fil.,' *P. obtusilobum*, Desv., is retained as a Natal species, and evidently with reason, for the involucre even when visible (which is seldom) is strictly rudimentary, and the sori as a whole show all the irregularity in shape and size of other species of *Phegopteris*."

Kuhn confines *P. obtusilobum*, Desv. (*Aspid. Desvauxii*, Mett.), to Madagascar, and rejects *N. conterminum* from the African continent ; and I have seen no reason why either should be credited to South Africa.

This cannot be regarded even as a permanent variety of *N. Bergianum*, Bkr., as sori with and without indusia occur on the same frond, and the same thing happens sometimes with *N. molle*.)

101. *NEPHRODIUM BERGIANUM*. Baker.

Plate XCVI. Nat. size. b. Fertile pinnæ. c. Sorus.

Crown procumbent or sub-erect, or sometimes elongated into a stout rhizome of several inches ; slightly scaly. Frond lanceolate, one to five feet long, six to fifteen inches broad, thinly herbaceous, minutely villose, or sometimes nearly glabrous, with a villose rachis, and a round, green, villose stipe six to twelve inches long. Frond widest at the middle, and tapering gradually to both ends. Pinnæ lanceolate, cut almost to the rachis, so that veinlets from neighbouring pinnules cannot meet. Pinnules oblong and rounded, or obliquely blunt pointed, or falcate, sometimes closely set and overlapping, and in others one line apart. In large fronds the pinnules are a quarter-inch broad, three-quarter inch long, and the lower one on the upper side sometimes larger, and then pinnatifid. Sori small, placed on the veinlets halfway between the mid-rib and the margin of the pinnules, often many in a pinnule ; involucre small, fugacious, thus causing the confusion noted under *N. conterminum*. It differs from *N. patens*, Sw., in

having the lower pinnæ reduced, and from *N. Mauritianum*, Fée, and *N. molle*, Desv., in the pinnæ being cut to or below the lowest veinlets.

Nephrodium Bergianum. Bkr. Syn. Fil. 269 ; Wood, Natal Ferns, 27.

Polypodium Bergianum. Schl. Adum. 20, tab. 9 (see under *N. conterminum* here) ; Kunze, Linnæa, 10.500 ; Pappe and Rawson, 39.

Aspidium Bergianum. Mett. ; Kuhn, Fil. Afr. 127.

Lastrea Bergiana. Moore's Index.

Aspidium patens. Schl. Adum. 22 ; Kze., Linnæa, 10.547.

Lastrea patens. Pappe and Rawson, 12.

Aspidium Gueinzianum. Mett. ; Kuhn, Fil. Afr. 134 ; Buchanan's List (under *N. Bergianum*), Hk. and Bkr. Syn. Fil. 269.

Aspidium natalense. Fée, Mem. VIII. 102.

South Africa only.

Abundant in all parts of Cape Colony and Natal.

Transvaal.—(Dr. Hans Schinz.).

102. *NEPHRODIUM MAURITIANUM*. Fée.

Rhizome stout, shortly creeping, paleaceous. Frond two-pinnatifid, two to four feet long, one to two feet broad, widely lanceolate, and tapering to both ends, and with a villose stipe one foot long or more. Texture thinly herbaceous, pinnæ as well as the rachis more or less villose on both surfaces, or sometimes nearly glabrous. Pinnæ lanceolate, sometimes twelve to fourteen inches long, one inch broad, cut into falcate pinnules, which are connected below so far as to allow two or more pairs of veinlets from neighbouring pinnules to meet. Veinlets numerous, not forked, with medial sori, and a fugacious indusium.

This fern is placed by Lady Barkly and also by Buchanan under *N. molle*, Sw., which it resembles, in having several pairs of veinlets united ; but the texture and habit of the plant are exactly those of large forms of *N. Bergiana*, from which it can only be distinguished by its veins, and to which it is more closely connected than to *N. molle*, Sw.

This is *N. elatum*, Baker, "Syn. Fil.," 502, but that was evidently a badly chosen name, as *N. elatum*, Desv., is our *N. catopteron*, a different plant. Mettenius and Bojer have each an *Asp. elatum*, and Baker himself had a previous *Nephrodium* (*Sagenia*) *elatum*, Bkr. ("Syn. Fil." 298), also quite a distinct plant. However Mr. Baker now writes that his *N. elatum* ("Syn. Fil." 502) proves to be *N. Mauritianum*, Fèc, Mauritius and Natal; so often confused with *N. molle* and *N. Bergianum* that its separate distribution is not known, and though represented in the various herbaria, it is always by specimens without localities.

Bazija, Transkei (Rev. R. Baur).

Natal.—Head of Bay of Natal (Buchanan).

103. NEPHRODIUM MOLLE. Desv.

Plate XCVII. Nat. size. b. Fertile pinnules.

Rhizome procumbent, three to six inches long, stout, and with abundant fronds. Fronds one and a half to two feet long, five to seven inches broad, bi-pinnatifid, firmly herbaceous, and brittle, deep green, densely villose, or even hairy all over, including the rachis and stipe. Pinnæ cut only about halfway down from the margin to the mid-rib into rounded, close or overlapping lobes, sometimes obliquely pointed; lower pinnule on upper side often larger, and with forked veinlets. Lower pinnæ smaller than the others, often more distant and deflexed. Veins about six pairs in a pinnule, of which two to four pairs unite with those of the next pinnule. Sori medial, rather large, and with a black indusium which soon disappears.

Kuhn mentions var. *violascens*, Mett., which has a purplish rachis as found in Natal by Gueinzus.

N. molle is a widely distributed plant, having many varieties in different parts of the world, and found throughout Africa, though evidently rare in Cape Colony.

Kuhn, and P. and R. refer *Asp. patens*. Schl. to this species,

but there is nothing in either description to indicate that it is not *N. Bergianum*, Bkr., which is abundant in the locality given (Table Mountain), while I have seen no specimen of this from that part of the colony.

Neph. molle. Desv.; Hk. and Bkr. Syn. Fil. 239; Buchanan's List, No. 92.

Aspidium molle. Sw.; Kuhn, Fil. Afr. 136.

Polypodium parasiticum, L.

Former collectors mostly gave this name to *N. Mauritium*, Fée, and Kuhn mentions Bergins, Mund and Maire, Ecklon and Zeyher, Drège, and others; but I have seen no located specimens from either of these, nor any specimen from east or west province.

Kaff.—Perie Forest.

Natal.—Moist and shady places on the coast, and common from Inanda to Umpumulo (Buchanan).

Transvaal.—(Buchanan, Lady Barkly).

104. *NEPHRODIUM UNITUM.* R. Br.

Plate XCVIII. Natural size.

Rhizome creeping, black, slender, paleaceous. Frond pinnate, coriaceous, glabrous, or slightly villose on the underside, ovate oblong, one and a half to two feet long, six to eight inches broad, with a slightly villose rachis, and a brownish, villose or nearly glabrous stipe twelve to fifteen inches long. Pinnæ sessile or shortly stalked, three to five inches long, one-half to three-quarter inch broad, lanceolate, pointed, with the margin cut one to two lines deep into roundish obliquely pointed lobes. Lower pinnæ as large as, or larger than, those above; upper pinnæ more closely placed, and slightly reduced, but at the point of the frond the pinnæ are suddenly reduced to a pinnatifid terminal lobe. Veins pinnate, veinlets not forked, but several pairs of veinlets from neighbouring pinnules unite below the sinus, and the abundant sori are situated on the veins near where they meet, or in the lobes near the margin. Indusium small, fugacious.

Var. PROPINQUUM, R. Br. (var. *hirsuta*, Mett.), differs from the type in having rachis and underside villose or hairy, and is recorded from Zambesi northward, but all our specimens are very slightly villose, or almost glabrous.

Buchanan finds *N. Plantianum*, P. and R., from specimens in the Rawson Herb. to be this ; though maintained as a species by Kuhn.

Nephrodium unitum. R. Br.; Hk. and Bkr. Syn. Fil. 289 (not Seiber).

Aspidium unitum. Mett.; Kuhn, Fil. Afr. 143.

Aspidium Ecklonii. Kze. Linnæa, 10. 546.

Nephrodium Ecklonianum. Pappe and Rawson, 14.

Nephrodium Plantianum. Pappe and Rawson, 14 ; Kuhn, Fil. Afr. 139 (Buchanan, see above).

Tropics of America, Asia, Australia, Africa, and African Islands ; growing in exposed swamps, or by streams ; local and rather rare in Cape Colony, often along with *N. Thelypteris*, Desv.

West.—Hot springs at Brand Valley, Worcester (Rawson), Knysna.

East.—Uitenhage (Holland), Zwartkops River (Eck.), Van Staaden's River (Browning, Bolus, 1709), Kowie, &c.

Kaff.—Pondoland (Drège), not found or recorded from Kaffraria.

Natal.—Common from the coast to Umpumulo and Maritzburg (Buchanan), Inanda (Wood), Noodsberg (M'Ken).

105. NEPHRODIUM THELYPTERIS. Desv.

Plate XCIX. Natural size, barren. b. Fertile, c. Barren pinnules showing venation.

Rhizome long, slender, branching, wide creeping, subterranean. Frond herbaceous, two-pinnatifid, glabrous, ovate-lanceolate or lanceolate, one to two feet long, three to six inches broad, with a slender naked stipe, often one foot long, and a glabrous, slender rachis. Pinnæ opposite or alternate, the lower about as long as the others, but more scattered ; sessile, bluntly lanceolate, divided to near the mid-rib into close, rounded, entire, rather unequal pinnules ; the lower one above and below often

rather longer, and crossing the rachis obliquely. Fertile frond, or fertile pinnæ, with the margin recurved so that the pinnules look rather narrower and more triangular. Veinlets free, mostly forked in the barren pinnules. Sori small, almost marginal; indusium small, deciduous, ciliated, glandular.

Var. *β. squamuligerum* (Schl.) has the mid-rib of the pinnæ scaly with short, wide, whitish scales, and to it all the South African specimens I have seen belong. Kuhn credits this variety to South Africa and New Zealand only.

N. Thelypteris has a different habit of growth from most of the other *Nephrodiums*, for owing to its long slender underground rhizomes it takes possession where it gets a hold, and forms a mass of fronds several yards wide. *N. unitum* which often grows intermingled with it also has this habit.

Nephrodium Thelypteris. Desv.; Hk. and Bkr. Syn. Fil. 271.

Var. *β. squamuligerum*. Schl. Mihi. =

Nephrodium Thelypteris. Desv. *β. (N.) squamulosum*. Hk., Hk. and Bkr. Syn. Fil. 271.

Aspidium Thelypteris. Sw. *β. squamuligerum*. Schl. Adum. 23, tab. II.; Kuhn, Fil. Afr. 142.

Aspidium Drègei. Fée.

Aspidium rivulorum. Thbg. ex. Eckl. fil. exs.

Polypodium Natalense. Presl., Hb.

Lastrea Thelypteris. P. and R. 12.

Polypodium tottum. Thunb. fl. cap. 735 (?).

West.—Hex River (Mund and Maire), Cape Flats, Table and Devil Mountains, Paarl, Tulbagh (P. and R.), Klip River, Swellendam (Holland).

East.—Uitenhage, Kowie, Howison's Poort, and Brookhuizen's Poort (Dr Atherstone), Somerset East (Guthrie, Bolus, 1705).

Kaff.—Rare, Komgha (Flanagan), Thomas Mountain (Mrs. Kitton), Greytown.

Natal.—Very common on the coast, but extending to the far uplands (Buchanan).

106. *NEPHRODIUM FILIX-MAS*, Rich., var. *ELONGATUM*.

Plate C. Pinna, nat. size.

Rhizome short, procumbent or sub-erect, densely paleaceous,

with large, ovate, pointed, scarious, yellowish brown scales. Frond deltoid, herbaceous, four-pinnatifid, one to four feet long, one to three feet broad, with a stout rounded stipe one to two feet long, which is abundantly paleaceous toward the base, and with scattered large scales upward, as also on the rachis and secondary rachises. Pinnæ widest at the base; lower pinnæ much the largest, unequally deltoid, having larger pinnules on the lower side; secondary pinnæ lanceolate or ovate-lanceolate; the larger ones cut below into separate, ovate, sharply toothed pinnules, which are closer or confluent above. Smaller pinnæ cut only halfway to the mid-rib; pinnules and segments all rounded, and with several sharp-pointed teeth, of which one pointing upward is generally largest. Sori numerous, rather large; indusium not hairy.

This species is much stronger growing than the next, and when fully mature is easily distinguished; but young plants are difficult to separate. The frond is more triangular in outline, the lower pinnæ are largest, the colour of the underside is less glaucous, and the rhizomes do not run, but produce four to twelve fronds each. The crown is clothed with large yellowish scales, and this is about the only point in which this plant resembles the well-known male fern, *N. Filix-mas*, of Europe; but I have adopted the above name on the authority of Mr. Baker, who finds intermediate and connecting forms in other countries. It is included by Buchanan, M'Ken, and Wood in *N. inæquale*, Schl.; and Lady Barkly's specimens of *N. inæquale* all belong to this species.

Schlechtendal's description and figure leave no room for doubt that he also included both, or at least this, in his *A. inæquale*; while Kunze makes this *A. inæquale*, Schl., and our next species, *A. inæquale*, Schl., var. *montanum*. It appears also to be Pappe and Rawson's *Lastrea pentagona*; while Kuhn makes it a separate species as *Aspidium elongatum*, Sw., and also maintains *Lastrea pentagona*, Moore (as from Natal).

Nephrodium Filix-mas, Rich. γ. *elongatum*. Hk. and Bkr. Syn. Fil. 272.

Aspidium elongatum. Sw.; Schrad. Jour. 1800 II. 38; Kuhn, Fil. Afr.

132.

Nephrodium elongatum. Hk. and Gr. icon. 234.

Lastrea pentagona. P. and R. 13, Kuhn, Fil. Afr. 139.

Aspidium inæquale. Schl. Adum. 23 (in part) ; Kunze, Linnæa, 10, 549.

Distributed over most of Africa and African Islands, as well as East Indies, and Southern N. America.

West.—Table Mountain (Guthrie, Bolus, 1707), Cape (Pappe).

East.—Fern Kloof, Boschberg (MacOwan), Voorman's Bosch, Van Staaden's River (Browning), Compassberg, 8200 feet alt. (Bolus, 1973), Bedford (Miss Cook).

Kaff.—Main, Transkei (Mrs. Young), very common all along the Amatolla forests.

Natal.—Inanda (Wood), (*N. inæqualis* including this, common all over the colony. Buchanan, Wood).

Transvaal.—Macamac (M'Lea).

107. NEPHRODIUM INÆQUALE. Hk.

Plate CI. Natural size.

Rhizome procumbent even at the crown, and not so scaly as in last species, several inches long, and often with slender rhizomes a foot long proceeding from them. Frond firmly herbaceous, glabrous, three-pinnatifid, ovate-lanceolate, one to one and a half feet long, six to eight inches broad, with a paleaceous stipe one foot long, and with scattered scales along the rachis and mid-rib. Lower pinnæ not larger or rather less than those above, and almost equal-sided. Pinnæ all pointed from a wide base, divided below to the channelled rachis into ovate-oblong, obtuse, lobed or pinnatifid pinnæ, which are sharply serrated, and have a rounded or shortly cuneate base. Sori very abundant ; involucre persistent, not hairy.

As stated under *N. Filix-mas*, var. *elongatum*, this species and that are very closely allied, and if really distinct, often confused. It also approaches very closely some of the forms of the European *N. spinulosum*, Desv., and all the specimens so named in the Colonial herbaria are this plant. Baker ("Syn. Fil." 276) mentions *N. spinulosum*, Desv., as found "sparingly in Cape Colony," and Kuhn quotes Drège's locality on *P. and R.*'s

authority, but I have seen no specimens which would indicate more than two species, of which *N. Filix-mas*, var. *elongatum*, is one, and the other is the present plant.

If it cannot be separated from *N. spinulosum*, Desv., our South African plants might all be included there, and *A. inæquale*, Schl., discarded; but meantime I follow Baker in calling this *N. inæquale*, and omit *A. spinulosum*, Sw.

Nephrodium inæquale. Hk. Sp. IV. 125; Hk. and Bkr. Syn. Fil. 277.

Aspidium inæquale. Schl. Adum. 23 (in part); Kuhn, Fil. Afr. 134.

Aspidium inæquale, β . *montanum.* Kze. Linnæa, 10.549.

Lastrea inæquale. Presl.: Pappe and Rawson, 12 (in part), (*L. spinulosum*, P. and R., 13).

Known as a South African species only, and evidently rare, most of the localities reported referring to *N. Filix-mas*, var. *elongatum*.

West.—Swellendam (Drège).

East.—Near Grahamstown (Holland), Sneeuwebergen and Wittebergen (Drège), Bedford (Miss Cook).

Kaff.—Perie Forest, rare, Komgha (Flanagan).

Natal.—Buchanan mentions the two forms, but does not state distribution.

108. NEPHRODIUM ATHAMANTICUM. Hk.

Plate CII. Natural size.

Rhizome procumbent, one to one and a half inches diameter, naked, except the crown, which has linear brownish scales adpressed to the involuted young fronds. Frond sub-coriaceous, glabrous, widest at the base, and tapering regularly upward, one and a half to two feet long, six to nine inches broad, with a compressed stipe six to twelve inches long, which is thickly paleaceous at the base, and more or less scaly upward, and through the rachis and pinnæ-rachises, though sometimes all are naked and shining, Lower pinnæ largest, six inches long, three to four inches broad at the base, stalked or sessile, and with lanceolate pinnules, rather one-sided at the base, of which only the lowest are pinnate, the

others being cut halfway to the mid-rib or more into blunt almost entire or crenated lobes, with reflexed edges. Sori abundant, below the sinus or near the mid-rib; indusium persistent. A South African fern only, growing in exposed places, and sometimes difficult to distinguish from *N. Filix-mas, elongatum*, when the latter is growing exposed to the sun. The more coriaceous texture, and the absence of sharp teeth, are the best marks. The lower lobe of the pinnule is generally larger on the upper side than the corresponding one on the lower side. This fern is called by the natives "Inkomokomo," and the rhizomes are said to be used as a vermifuge for the cure of tapeworm.

Nephrodium athamanticum. Hk. Sp. IV. 125, pl. 258; Hk. and Bkr. Syn. Fil. 277.

Aspidium athamantica. Kunze, *Linnaea*, 18. 123.

Lastrea athamanticum. Pappe and Rawson, 13.

Lastrea Plantii. Moore, in Hk. Jour. Bot. V. 227.

Kaff.—Bazija (Baur), St. John's River (Holland).

Natal.—From Inanda inland (Wood), in most parts of the colony (Buchanan), Camperdown, Pine Town, Maritzburg (M'Ken), Moore River (Gueinzus).

Transvaal.—Macamac (M'Lea), Magalisbergen (Sanderson).

109. NEPHRODIUM BUCHANANI. Baker.

Plate CIII. Natural size.

Crown sub-erect, paleaceous. Frond firmly herbaceous, three-pinnate or four-pinnatifid, deltoid, one to three feet long, one to two feet broad, with a stipe one foot long, which is densely set with reflexed, lanceolate, pointed, dark scales toward the base, while the upper part, as well as the rather rigid rachis and secondary rachises, are set with spreading or reflexed hair-like dark scales, which are smaller upward. Lowest pinnæ largest, and with the lower side larger than the upper; other pinnæ almost equal sided, tapering slowly from a base three inches broad. Pinnules ovate-lanceolate, obtuse, cut to the mid-rib below into oblique, oblong, obtuse segments, which are entire, or the lower ones

pinnately blunt lobed. Sori near the veins in the upper half of pinnules rather large. Indusium small, not hairy, persistent. Veins pinnate with few forked veinlets. Buchanan says—"While growing, the fronds are covered with long hairs, strikingly transparent in the sunlight, but quickly disappearing in the process of drying."

Neph. Buchananii. Bkr. *Icones Plantarum*, plate 1662 ; Hk. and Bkr. *Syn. Fil. Ed. II.* 498.

Neph. eximium. Cord. ined.

Lastrea crinita. Boivin. ined. (not Desv.),

(*Lastrea oppositum*, P. and R. (Appendix No. 2) is doubtfully referred here by Lady Barkly, but their description does not answer this.)

South Africa, Bourbon, and Madagascar ; growing in shade near streams.

Kaff.—Griqualand East, Hancock's Drift, Umzimkulu (Buchanan).

Natal.—Nottingham, 4000 feet ; Zwartkops, Karkloof (Buchanan).

Transvaal.—Pilgrim's Rest, Drakensberg (J. H. M'Lea).

110. NEPHRODIUM CATOPTERON. Hk.

Plate CIV. Natural size.

Crown sub-erect. Fronds scented, herbaceous, villose on both surfaces, three-pinnate or three-pinnatifid, deltoid, or ovate-deltoid, four to five feet long, three feet broad, with a stipe two to four feet long, which like the rachis and frond is finely villose. Pinnæ widely lanceolate, pointed, the lower ones two feet long, unequally deltoid, with longer pinnules on the lower side. Pinnules lanceolate, cut to the mid-rib into oblong segments half-inch long, and three lines broad, which are obliquely connected by the whole base, rounded at the apex, and cut along the margin into three to five pairs of oblique rounded lobes. Veinlets forked or trifid. Sori abundant, medial. Indusium persistent, villose.

Nephrodium catopterum. Hk. *Sp. IV.* 137 ; Hk. and Bkr. *Syn. Fil.* 284 ; Wood's *Natal Ferns*, 28.

Aspidium catopterum. Kze. *Linnæa*, 10. 550.

Lastrea catoptera. Pappe and Rawson, 12.

Aspidium lanuginosum. Willd. *Hb.*; Kuhn, *Fil. Afr.* 135.

Lastrea lanuginosa. Moore's Index, 87.

Nephrodium elatum. Desv. (*vide* Kuhn, not *N. elatum*, Baker).

Aspidium odoratum. Sieb., Mett. (not *N. odoratum*, Baker).

South Africa and Mascarenes; growing in shade near streams.

West.—George, and Knysna (Lady Barkly), Koratra (Drège).

Kaff.—Near Mission Station, St. Augustine, Transkei (Baur, 221).

Natal.—From Inanda inland (Wood), Omsamcaba (Drège), Noodsberg,

Umpumulo (Buchanan).

III. *NEPHRODIUM CRENATUM*. (Forsk.) Mihi.

Plate CV. Natural size.

Crown procumbent, and like the base of the stipe clothed in abundant linear shining brown scales three-quarter inch long. Frond herbaceous, scented, deltoid, three-pinnatifid, six to nine inches long, four to six inches broad, with a channelled stipe which is glabrous below, with a tuft of scales at the base; but upward it is like the rachis and whole frond finely villose on both surfaces. Pinnæ widely lanceolate, the lower largest and deltoid, three inches long, two inches broad, with the pinnules on the lower side larger and more cut. Pinnæ cut to the rachis into oblong, ovate, blunt, pinnatifid pinnules, which are separate below, but connate above; those in the lower pinnæ stalked, and again cut into similar pinnatifid segments, with minutely crenate blunt lobes. Sori numerous, near the mid-rib; indusium large, light coloured, persistent, horse-shoe shaped, but with one side longest; bristly with white hairs.

In form the indusium approaches that of the *Athyrium* section of *Asplenium*.

Baker's description indicates a rather larger plant, but the above is from Mr. Bolus' specimens.

Polypodium crenatum. Forsk. *fl. aeq. Arab.* 185.

Aspidium crenatum. Willd.; Kuhn, *Fil. Afr.* 129.

Nephrodium odoratum. Baker ; Hk. and Bkr. Syn. Fil. 280 (not *A. odoratum*, Sieber).

Nephrodium hirsutum. Don. Prod. Nep. 6.

South Asia, Mascerenes, and Abyssinia ; and collected in the Transvaal by Mr. Bolus, and at Macamac by Mr. Ayres. (Buchanan's List, No. 4, p. 30.)

112. *NEPHRODIUM CICUTARIUM*. Baker.

Plate CXLVIII. Part of lower pinna, natural size.

This species can only be introduced here with some doubt, as I have seen no South African specimen of it, and it is not known at Kew from our area ; but in Buchanan's List (No. 5, page 30) is mentioned "*A. Sagenia*, apparently very near to if not a variety of *Neph. cicutarium*," sent by Mr. Ayres from Macamac, Transvaal.

The section *Sagenia* is characterised by veins anastomosing copiously, and as this could not be mistaken for any other plant here included, and as *Neph. cicutarium* is the only *Sagenia* recorded from continental South Africa, the following description and figure are given from specimens from Johanna Island, kindly forwarded to me from Kew.

Frond deltoid, three-pinnatifid, glabrous, thinly herbaceous but firm, with three to six pairs of pinnæ, and a pinnatifid apex. Lower pinnæ opposite, eighteen inches long, twelve inches broad, deltoid, stalked, cut to the rachis below, and to near the rachis above, into numerous, alternate pinnules, of which the upper are lanceolate, increasing from the point downward to six inches in length, one-half to one and a half inches broad, tapering to the acute point, and cut two to three lines deep into rounded oblique lobes three lines broad ; while the lower are six to nine inches long, three to four inches broad, and pinnatifid like the upper part of the pinna into rather distant, lanceolate, deeply crenate pinnules half-inch broad, and two to three inches long. Other pinnæ gradually smaller upward. Mid-ribs distinct throughout, other veins fine but anastomosing freely into rather irregular areolæ.

Sori terminal on a free veinlet in the centre of the larger areolæ, and forming a straight line near the mid-rib in the simple pinnules, one sorus below each lobe of the margin; in the pinnatifid pinnules the sori occupying a similar position in the segments and absent from near the main mid-rib. Stipe and rachis brownish, shining. A variable species.

Genus XXIII. NEPHROLEPIS. Schott.

Fronds simply pinnate, the pinnæ lanceolate, articulated to the rachis, and having one central vein from which arise the spreading side veins each forked into three or four sub-parallel veinlets, the upper one of which is rather shorter than the others, and ends in an intramarginal round sorus, covered by a roundish or emarginate indusium. This is a very natural little tropical genus, of which one species extends to Natal, and other two occur in Zambesia.

113. NEPHROLEPIS BISERRATA. Schott.

Plate CVI. Natural size.

Crown tufted. Frond pinnate, sub-coriaceous, widely lanceolate, three to four feet long, eight to twelve inches broad, with a short stout stipe, which is slightly scaly at the base. Pinnæ sessile, alternate, glabrous, articulated to the rachis, lanceolate-acuminate from a rounded base, four to six inches long, three-quarter inch broad; the lower barren ones finely serrate; the fertile with shallow crenations two lines wide, which are slightly serrated, or with a small tooth between each. Sori in a straight line, one below each sinus, and about a line distant from it. Indusium reniform or nearly round, persistent. Rachis almost glabrous, or with rufous shag about the base of the pinnæ.

Nephrolepis biserrata Schott.; Kuhn, Fil. Afr. 155.

Nephrolepis acuta. Presl.; Hk. and Bkr. Syn. Fil. 301.

Tropics generally.

Natal.—(Gueinzus), abundant in openings in the bush swamp at head of Bay of Natal, and a few plants on rocks by Palmiet and Nonoti only (Buchanan, Wood).

Genus XXIV.—OLEANDRA. Cav.

Fronds simple, articulated to the long woody scandent rhizomes, and having one central costa from which the smaller veins spread to the margin. Veins rising one or two together, simple or dichotomously forked into parallel veinlets, and bearing the sori in an irregular line near the mid-rib, and mostly on unforked veins. Sorus covered by a reniform indusium. This genus consists of a few species of similar and very distinct habit, all tropical or almost so.

114. OLEANDRA ARTICULATA. Cav.

Plate CVII. Fig. 1. Natural size. b. Portion of frond enlarged showing venation.

Rhizome very long, slender, scandent above ground, with scattered fronds, and abundant, linear, adpressed, shining brown scales. Fronds simple, thinly coriaceous, glabrous, lanceolate, nine to fifteen inches long, one to one and a half inches broad, tapering quickly to an acute point, and rather slowly to a rounded base. Stipe one inch long, jointed close to the rhizome, with numerous involved scales below the joint, and with scattered lanceolate scales above the joint and on the mid-rib. Roots very long and wiry, hanging singly from below each old frond. Margin of frond entire, slightly undulated. Sori rather large, in an irregular line on each side the mid-rib, and one to three lines distant from it. Indusium reniform. Veins numerous, easily seen, and several times forked. When grown in sunshine the fronds are shorter, and the rhizome more scaly. Some specimens in Herb. Gub. have the rhizome scales nearly black, and the frond jointed a half-inch from the rhizome.

Oleandra articulata. Presl.; Pappe and Rawson, 13; Kuhn, Fil. Afr. 144; Hk. and Bkr. Syn. Fil. 302.

Aspidium articulatum. Sw.; Kunze, Linnæa, 18.123.

Oleandra neriiformis. Hk. Sp. 4, p. 156, in part (not *O. neriiformis*. Cav.)

Tropical and sub-tropical Africa and islands; among rocks, mostly in shade though sometimes exposed.

Natal.—(Gueinzus), Intshanga, Maritzburg, Kranzkloof, Noodsberg, Umpumulo, 2000 to 3000 feet (Buchanan), Midland districts (Wood). Transvaal.—Magalisberg (Zeyher, Burke, 530).

Genus XXV.—POLYPODIUM. Linn.

Sori round or nearly round, without indusium.

A very large genus, containing species of very diverse habit, though all our species except the first two have a considerable general resemblance among themselves. The earlier botanists included under *Polypodium* all ferns with round dorsal sori, whether they had an indusium or not; but since then the genus even as above restricted has been divided by some botanists into many genera, distinguished by the venation. Our species are arranged under the following sub-genera in Hk. and Bkr. "Syn. Fil."

Desmobryoid series. Stipes not articulated to the caudex. (Pheopteris. Mett.)

§§§ Goniopteris. Presl. Veinlets of neighbouring pinnules uniting. Species 115, 116.

Eremobryoid series. Stipe articulated to the rhizome. (Polypodium. Mett.)

§§§§ Eu-polypodium. Veins free. Species 117.

§§§§§ Goniophlebium. Blume. Sori terminal on the single free veinlet inside the large regular areolæ. Species 118, 119.

§§§§§§ Campyloneuron. Presl. Primary veins distinct from the mid-rib to the edge, connected by parallel transverse veinlets. Areolæ similar, containing two or more sori; the free veinlets all directed toward the edge.

— *Nipholobolus*, Auct. Under surface woolly. Species 125.

§§§§§§§§ *Phymatodes*. Presl. Areolæ fine, copious, irregular; the free veinlets spreading in various direction. Species 120, 121, 122, 123, 124, 126.

The other four sub-genera of the synopsis—*Eu-phlegopteris*, *Cyrtomiphlebium*, *Dictyopteris*, and *Phlebodium*—are not represented in South Africa, except the first, to which belongs *Polypodium obtusilobum*, Desv., which I cannot maintain, but which has been already noticed along with *Nephrodium conterminum*, Desv.

Key to the species.

§ Stipe not articulated to the rhizome or crown. Veinlets of neighbouring pinnules uniting.

115. *P. proliferum*. Frond pinnate, with lobed pinnæ. Sori medial on the veinlets.

116. *P. unitum*. Frond pinnate, with pinnatifid pinnæ. Sori close to the mid-rib of the lobes, and situated on the veinlets.

§§ Stipe articulated to the rhizome. Frond two-pinnate or two-pinnatifid.

117. *P. vulgare*. Fronds without scales; veins free.

118. *P. incanum*. Frond clothed with petate scales.

119. *P. ensiforme*. Frond without scales, and with a line of large areolæ each side the mid-rib, from which veinlets run to the margin, or again anastomose. The large areolæ containing one free veinlet.

120. *P. Phymatodes*. Frond without scales, veinlets anastomosing freely, and the larger areolæ containing smaller areolæ besides free veins.

§§§ Stipe articulated to the rhizome; frond simple (except 123 β.).

121. *P. lineare*. Frond one-half to one foot long, without scales. Veins anastomosing freely and irregularly. Sori sunk, placed in a medial row on each side of the mid-rib.

α. Frond herbaceous; rhizome long.

β. simplex. Frond larger, thinner, veins more distinct.

γ. Schraderi. Frond small, coriaceous; rhizome short, tufted.

122. *P. normale*. Frond one to two feet long, without scales. Sori superficial, scattered, or sometimes in an irregular line near the mid-rib.

123. *P. lanceolatum*. Frond set with peltate scales, simple, lanceolate.
 — *β. sinuatum*. Frond sinuate or pinnatifid.
124. *P. lycopodioides*. Fronds dimorphous, naked, with a line of large medial areolæ containing the sori in one regular line in free veinlets. Veinlets outside the areolæ anastomosing irregularly.
 = *β. Mackenii*. Larger, with a wider, flattened, paleaceous, epiphytal rhizome, and larger thinner fronds.
125. *P. Africanum*. Fronds coriaceous, clothed on the underside or at first on both surfaces with stellate-pubescent. Sori numerous, small, scattered over the upper part of frond.
126. *P. irioides*. Frond coriaceous, one to four feet long, without pubescence. Sori very numerous, scattered, minute.

115. POLYPODIUM PROLIFERUM. Presl.

Plate CVIII. Natural size.

Rhizome creeping. Frond thinly coriaceous, simply pinnate, lanceolate, two feet long, six to eight inches broad, with a naked stipe one foot long. Rachis and frond glabrous, or very minutely villose; pinnæ lanceolate, acuminate, sessile, from a rounded base, four to five inches long, one-half to three-quarter inch broad, cut along the margin about one line deep into rounded oblique lobes, with four to six pairs of veinlets meeting below the sinus. Veins conspicuous; sori on the middle of the veinlet, often irregular or elongated as in *Gymnogramme*. Wood remarks—“A coarse-looking fern, having much the appearance of *Nephrodium unitum*, growing in similar places, and often in company with it; it is sometimes erect, and sometimes decumbent and rooting at the point, and is easily recognised by its habit of sending out long branches, which take their rise from an angle between the main rachis and one of the pinnæ, no other Natal *Polypodium* having this peculiarity.”

This species appears to be omitted by Kuhn, and resembles small specimens of *Polypodium unitum*, Hk.

Polypodium (*Goniopteris*) *proliferum*. Presl.; Hk. Sp. V. 13; Hk. and Bkr. Syn. Fil. 315; Wood, Natal Ferns, 31; Buchanan's List, No. 96; Lady Barkly's List, No. 114.
Ampelopteris. Kunze.

South Asia, North Australia, Tropical South Africa, and Mauritius.

Natal.—Coast to 1000 feet, Banks of Umhloti near Todd's Mine, and of the Impisi near Tugela (Buchanan), Umgeni Brickfields (Wood), (Herb. Barkl. 114, Herb. Bolus, 3979).

116. *POLYPODIUM UNITUM.* Hk.

Plate CIX. Natural size.

Crown procumbent or sub-erect. Fronds thinly sub-coriaceous, semi-transparent, glabrous or minutely villose, often proliferous, simply pinnate, widely lanceolate, two to four feet long, one to two feet broad at the middle, less below, and with a naked, channelled, herbaceous stipe, one foot or more long. Pinnæ sessile, lanceolate, acuminate, from a rounded base, six to twelve inches long, one inch broad, and cut one to three lines deep into obtuse, rounded, oblique, entire, or slightly crenate lobes. Veins conspicuous, five to six pairs of veinlets meeting below the sinus. Sori small or rather irregular, situated on the veinlets close to the mid-rib of the lobes.

P. unitum. Hk. Sp. V. 5; Hk. and Bkr. Syn. Fil. 317; Wood's Natal Ferns, 31; Buchanan's List, 97.

Phegopteris unita. Mett.; Kuhn, Fil. Afr. 124.

Gymnogramme unita. Kze., Linnæa, 18.115.

Goniopteris sylvatica. Pappe and Rawson, 39.

Natal and Cameroons only, growing in shady ravines.

Natal.—(Gueinzus, Bolus, 3980), abounds from Inanda inland (Wood); common at Umpumulo, 2000 to 3000 feet (Buchanan), Maritzburg, Great Noodsberg, Fort Buckingham (M'Ken).

117. *POLYPODIUM VULGARE.* Linn.

Plate CX. Natural size.

Rhizome three to twelve inches long, two to four lines diameter, branched, and clothed with light yellow somewhat deciduous

scales. Fronds jointed to the rachis, firmly herbaceous, simply pinnate, glabrous, six to twelve inches long, one and a half to two inches broad, with a naked stipe of two to four inches. Pinnæ oblong, one inch long, quarter-inch broad, rounded or shortly pointed, widened both ways at the adnate base so that the pinnæ meet below though apart above. Sori abundant, large, set in a row near each side of the mid-ribs. Veins free; veinlets pinnate.

I have seen specimens two feet long and nine inches wide, and Kunze mentions two forms.

This is a widely distributed fern, known as the English Polypody; growing on rocks or dry turf banks.

Polypodium vulgare. Linn.; Kze. Linn., 10.499; Pappe and Rawson, 39; Wood's Natal Ferns, 31.

Polypodium australe. Fée, gen. 236.

(*Polypodium* (*Grammitis*) *australe*, Mett., is an Australian and South American species with free veins, and undivided fronds; credited by Kuhn to "Prom. Bon Spei." (Pœppig), but evidently a mistake.)

West.—Table Mountain (Drège), George (Rawson).

East.—Bellerne, Bedford (Holland), Boschberg (MacOwan), Howison's Poort, Grahamstown (Dr. Atherstone), Oudeberg (Bolus 701), Winterberg (Eck.).

Kaff.—Kat River (Eck.), Manubi (Bowker), Perie, 4000 feet.

Natal.—Sources of Mooi River, Lyndoch, The Dargle (M'Ken), Boston, Norton's, Riet Vlei, 4000 feet only (Buchanan), up country, rare (Wood), (Plant 311).

118 *POLYPODIUM INCANUM.* Swartz.

Plate CXI. Nat. size. b. Peltate scale of frond, magnified.

c. Scale of rhizome, magnified. d. Unusual form.

Rhizome very long, slender, woody, closely attached to tree trunks or on moss, and clothed with lanceolate, adpressed, dark scales. Fronds scattered, glabrous on the upper surface, simply pinnate, rather widest at the base, sub-coriaceous, involved when

dry, oblong deltoid, three to six inches long, one to two inches broad, with a hard stipe two to three inches long, which, like the underside of the frond, is clothed with small, ovate, pointed, peltate scales. Pinnæ oblong or linear, one-half to one inch long, two lines broad, with a widened adnate base, or sometimes not cut quite to the mid-rib; entire or irregularly crenate, with a rounded apex. Sori in a line on each side of the pinna, almost marginal. Veins anastomosing or free, but not easily seen.

This is one of those curious plants known as Resurrection plants, on account of the fronds curling up so as to show only the scaly underside of the frond during drought, and again expanding fresh and green when moist weather returns.

A specimen in Herb. Gub. has the frond larger, lower pinnæ separate, an inch long, and with one or two distinct pinnules on the lower side (fig. d.).

Polypodium incanum. Sw.; Schrad. Jour. 1800, II., 25; Kunze, Linnæa, 9.41; Kuhn, Fil. Afr. 147; Hk. and Bkr. Syn. Fil. 346.

Marginaria minima. Bory.

Polypodium Ecklonii. Kze. Linnæa, 10.498; Pappe and Rawson, 39.

Tropical America and Africa; epiphytal on trees, and often far up among the branches.

West.—Knysna (Lady Barkly).

East.—Uitenhage, Bushman's River (E. and Z.), Bedford (Holland), Grahamstown (Bolus, 1726), Kagaberg (MacOwan).

Kaff.—Beaufort (E. and Z.), Transkei (Drège), Komgha (Flanagan), abundant in Perie, Alice, Dohne, and all the larger forests.

Natal.—Common in upper and midland districts (Wood), Van Reenan's Pass (Dr. Rehmann, 7209), Maritzburg, Kranskop, Umpumulo, and common in upland bush (Buchanan).

Transvaal.—Macamac (M'Lea).

119. POLYPODIUM ENSIFORME. Thbg.

Plate CXII. Natural size.

Rhizome stout, creeping, branching, rooting, epiphytal, densely paleaceous toward the point, with laciniated, lanceolate,

ferruginous scales. Frond glabrous, thickly coriaceous, very various, simply pinnate, ovate-acuminate, four to nine inches long, three to six inches broad, with a channelled rachis six to nine inches long, and sometimes varying to trifid or even simple and lanceolate, four to six inches long, three-quarters to one inch broad, with a short glabrous stipe. In the less divided fronds the pinnæ are shorter, more rounded at the apex, and confluent below, but in the largest condition, which occurs on the same plant, the four to six pairs of pinnæ are quite separate, linear, one to four inches long, three lines broad, sharply pointed, entire or widely crenate, and with a widened and often decurrent adnate base. Lower pinnæ longest, others gradually less; terminal pinna four to five inches long, lanceolate, sinuate-crenate, pointed. Sori very large, in a straight line on each side of the mid-ribs, one to each crenature of the margin, and sunk into the frond. Veins immersed but easily seen, the primary veins forming one line of large areolæ along each side of the mid-rib; outside this, veins run to the margin, or sometimes again anastomose, while inside the large areolæ one free single vein (or sometimes with a loop on it) reaches as far as the centre, and there carries the sorus.

Polypodium ensiforme. Thunb. Prod. 172; Fl. Cap. 735; Schl. Adum. 19; Kze. Linn. 10.500; Kuhn, Fil. Afr. 147; Hk. and Bkr. Syn. Fil. 341.

Marginaria ensiformis. Presl.; Pappe and Rawson, 39.

Goniophlebium. Fée, gen.

South Africa only.

West.—Grootvadersbosch (Thunb), Stofpad (Mund and Maire), Swellendam (Lady Barkly), Knysna (Ecklon, Pappe), Millwood Gold Fields (Holland), Grenadendal (Zeyher), Dokamma (Drège).

East.—Kowie (Kresfelder).

Kaff.—Not found.

Natal.—Tugela (Gueinzus, Krauss, 299).

120. POLYPODIUM PHYMATODES. Linn.

Plate CXIII. Natural size.

Rhizome rather stout, firm, procumbent, at first paleaceous

with linear dark scales. Frond varying very much, pinnatifid or ovate, sub-coriaceous, glabrous, one-half to two feet long, six to twelve inches broad, with a naked stipe, not winged, six to twelve inches long. Pinnæ four to six pairs, sub-opposite, entire, three to five inches long, three-quarters to one inch broad, tapering above to a point, and connected by a wing a half-inch broad along each side of the rachis; the sinus between the pinnæ rounded at the base, and as wide as the pinnæ. Lower pinnæ generally longest; terminal pinna similar to the others, not much longer. Barren frond often narrower, more lanceolate, less deeply cut, and with wider and shorter pointed pinnæ; or occasionally small fronds are almost simple. Veins easily seen but not conspicuous, except the mid-rib and pinnæ mid-ribs. Veinlets anastomosing freely throughout, and with numerous free veinlets inside the areolæ. Larger areolæ containing the smaller ones, but with similar (*i.e.* not stronger) veins are also traceable, and the sori are immersed in the centre of these. Sori round or oblong, sometimes in one row on each side the mid-rib, and about two lines from it; at other times in about three irregular lines; the sori nearest the margin being smaller. On the same frond occur round sori and others three to five lines long, but the latter are exceptional. Pappe and Rawson's description of the frond may apply, but is not characteristic.

Polypodium Phymatodes. Linn. Sp. 7860; Kuhn, Fil. Afr. 151; Hk. and Bkr. Syn. Fil. 364.

Phymatodes vulgaris. Presl. tab. 196; Pappe and Rawson, 40.

Drynaria vulgaris. J. Smith.

Tropics of Asia, Australia, Africa and Islands. "Prom. Bon Spei" (Drège, *fide* Kuhn).

Natal.—In the bush around Durban, and West-End Park (M'Ken), Coast bush only, often on trees (Buchanan), Inanda (Wood).

121. *POLYPODIUM LINEARE.* Thunb.

Plate CXIV. Natural size.

Rhizome several inches long, slender, woody, paleaceous, with

dark, pointed, club-shaped scales. Fronds herbaceous, lanceolate, entire, four to twelve inches long, three-quarters to one and a half inches broad at the middle, and tapering to a point, and also tapering slowly to the short stipe. Fronds quite naked, or with a few scales below on the mid-rib when young. Sori large, sunk, mostly in the upper part of the frond, in a row on each side of the mid-rib, and halfway between it and the margin. Veins show very distinctly as a fine network on the upper surface, and when seen through have regular areolæ along the mid-rib containing free veinlets, and more or less irregular areolæ between these and the margin. Fertile frond often longer, and rather narrower than the barren.

Buchanan doubted if this and *P. normale*, Don., were both to be found in South Africa, but included *P. Schraderi*, Mett., as a species; and Wood evidently followed in excluding *P. lineare*, Thbg. I regard *P. lineare* as a common forest fern (in Kaffraria at least), and *P. Schraderi*, Mett., as a mere conditional variety of it, and not very common; while *P. normale* seems quite distinct in all the specimens I have seen.

Polypodium lineare. Thunberg, Fl. Jap. 335; Kuhn, Fil. Afr. 148; Hk. and Bkr. 354.

Polypodium Gueinzii. Mett. Polyp. No. 161, tab. III., f. 18, 19.

Tropical Asia and Africa.

Natal.—(*Gueinzii*), Forest near York (M'Ken), not known to Buchanan or Wood, but evidently included in their *P. Schraderi*.

Kaff.—*Bazija* (Baur), common in the Perie and other forests, growing in shade.

Var. β . *SIMPLEX*. (Sw.) Fronds larger and more thinly herbaceous, one and a half feet long, two inches broad. Veins more distinct.

Polypodium simplex. Sw.; Kuhn, Fil Afr. 153; Hk. and Bkr. Syn. Fil. 354.

Polypodium loriforme. Wall.; Hk. Sp. V. 57 (in part, Kuhn.)

Var. γ . SCHRADERI. (Mett.)

Plate CXV. Natural size.

Rhizome slender, short, and tufted, with black linear scales. Frond thick and leathery in texture, three to five inches long, half-inch broad, with the margin reflexed, and narrowed gradually to the base, but almost without stipe. Veins not distinctly visible without looking through, but the upper surface dotted all over with small holes like pin punctures. Sori more numerous than in the type. This form grows on rocks in sunshine, and in their extremes this and the type look very distinct, but gradually approach, evidently in accordance with the conditions of growth.

P. Schraderi. Mett. Polyp, No. 179, t. II., f. II.; Hk. and Bkr. Syn. Fil. 354; Kuhn, Fil. Afr. 152; Wood's Natal Ferns, 32.

Polypodium elongatum. Schrad.; Schl. Adum. 16, tab. 7; Kze. Linnæa, 10.499.

Phymatodes elongata. Presl.; Pappe and Rawson, 41.

Cape and Natal only. (Natal localities and some of the others include P. lineare, Thbg., as well as var. Schraderi.)

West.—Knysna (Lady Barkly), George (Mund and Maire), Olifant's River (Rev. Hesse).

East.—Blockhouse Kloof, Grahamstown (Atherstone), Bontjes River (Drège), Graaffreinet (Bulus, 819).

Kaff.—Shiloh (Rev. R. Baur), Perie, Toise River.

Natal.—All over the colony (M'Ken, Buchanan, Wood).

122. POLYPODIUM NORMALE. Don.

Plate CXVI. Natural size.

Rhizome slender, woody, running, branching, and rooting freely, clothed with lanceolate, pointed, deciduous, dark scales. Frond entire, thin, sub-coriaceous, glabrous, naked, lanceolate, one to two and a half feet long, one to three inches broad, tapering to a point, and tapering very slowly to a slightly margined

naked stipe three to six inches long. Mid-rib conspicuous, furrowed above, other veins rather obscure and irregular, but in large specimens having primary veins from the mid-rib to the margin at about every half-inch distance, between which numerous areolæ are formed, mostly including single or dichotomous free veinlets. In smaller fronds there are no primary veins, but numerous irregular areolæ. The sori are superficial, and in the typical *P. normale* are in a row near the mid-rib, but the Natal specimens mostly have them scattered irregularly near the mid-rib, and not having any regular position on the veins. This in Hk. and Bkr. "*Syn. Fil.*" is named var. β . *P. longifrons*, Wall. South-east Asia and Africa.

Natal.—Maritzburg, Richmond, and York (M'Ken), Seven mile bush, Upper Umkomas (Buchanan), Upper districts (Wood).

Kuhn omits *P. normale*, but includes *P. Pappei*, Mett. MS. which may be synonymous. Lady Barkly and Buchanan give it as a synonym, and I cannot distinguish a Natal specimen in Herb. Gub. named "*Phymatodes concinna*, No. 6, N. sp." (Pappe); but as Kuhn's description hardly agrees with *P. normale*, the following is translated from "*Filices Africanæ*," page 150.

"*Polypodium Pappei*, Mett. Msc. Rhizome creeping, as thick as a goose quill, clothed with ovate-acuminate, membranaceous, dark brown scales, two lines long, afterwards naked, green. Frond herbaceous, firm, glabrous, petiole one to three inches long; frond one foot long, two and a quarter inches broad, lanceolate, entire, often falcate-acuminate. Veins easily seen. Costal areolæ large, with a dichotomous free vein; outer areolæ two to four-seriate, Sori superficial, often in the outer angle of the costal areolæ, rarely a second in the next areola. Paraphyses none. (Mett. Msc.)

Pleopeltis concinna. Pappe, MS.

Polypodium loriforme. Hk. Sp. V. 57, in part.

Caffraria (Rawson), Natal (Saunderson)."

123. *POLYPODIUM LANCEOLATUM*. Linn.

Plate CXVII. Natural size, small.

Rhizome very long, epiphytal, slender and wiry, slightly branched, clothed in adpressed, lanceolate, dark scales. Fronds simple, linear-lanceolate, coriaceous, entire, rather obtuse, but tapering to both ends, especially to the base, four to twelve inches long, half-inch broad, with a paleaceous, or sometimes naked, wiry stipe, one to six inches long. The upper surface of the frond is often almost glabrous, and the underside and stipe are more or less paleaceous with minute peltate scales, which are black in the centre and lighter outside. Sori large, mostly in the upper part of the frond, and sunk into it in a row on each side the mid-rib. Veins obscure, forming areolæ with free veinlets; margin often inflexed. The scales on the frond are similar to those of *P. incanum*, but vary very much in number, and the size of the frond also varies. In strong growing forest plants the fronds are six to twelve inches long, with a wiry stalk, and only a few scattered scales; but in rock-grown plants, exposed to sunshine, the fronds are only two to three inches long, with short stalks, and are densely covered with scales.

Schlechtendal mentions vars. *latifolium* and *angustifolium*, but they are not distinct with us.

Polypodium lanceolatum. Linn.; Hk. and Bkr. Syn. Fil. 356; Kuhn, Fil. Afr. 147.

Polypodium lepidotum. Willd.; Hk. Sp. V. 56; Schl. Adum. 17, tab. 8; Kze. Linnæa, 10-497.

Pleopeltis ensifolia. Carm.; Hk. Ex. Fil. pl. 62.

Pleopeltis lepidota. Presl.; Pappe and Rawson, 40.

A small specimen in Herb. Gub. is named *Polypodium Zeyheri*, Sieb., No. 261.

Tropical and sub-tropical America, India, Africa, and Islands.

West.—Table Mountain (Bergins), Paradise, Swellendam, George (Rawson), Grootvadersbosch (Drège), Knysna (Pappe).

East.—Krakakamma, Bontjes River, Uitenhage, Winterberg (Drège), Albany.

Kaff.—Chumie, Kat River (Drège), Komgha (Flanagan), Bazija (Baur.), Perie, Frankfort, Dohne, Toise River.

Natal.—Maritzburg to Drakensberg, common (Buchanan), Inanda (Wood).

Var. *SINUATUM*. Mihi.

Plate CXVIII. Natural size.

Frond waved at the margin or irregularly pinnatifid, and in strong plants sometimes two or more of the lobes are an inch or more long. The sori are sunk into the frond, and show themselves through as raised projections on the upper side; and there are sometimes a few scales on the upper as well as on the under surface. Like the type this varies in size in accordance with exposure, but it is constant in its sinuate lobed character where it occurs, and has seldom an ordinary frond. Sometimes it is not unlike *P. incanum*, Sw., and the peltate scales and the rhizome are similar to that species.

East.—Tzitzikamma (Dr. Atherstone), Fordyce Tree (Holland), Boschberg (MacOwan).

Kaff.—Above Perie Mission Station, and above Evelyn Valley.

Natal.—Seven Mile Bush, Upper Umkomas, and on the heights near Yook (Buchanan).

124. *POLYPODIUM LYCOPODIODES*. Linn.

Plate CXIX. Fig. 1. Natural size.

Rhizome epiphytal, widely creeping, rather slender, one to two lines diameter, clothed with lanceolate, brown, pointed scales, which become afterwards nearly white. Fronds lanceolate, glabrous, coriaceous, three to five inches long, one-half to three-quarter inch broad, tapering slowly to the base, and slightly decurrent on the short petiole. Mid-rib distinct; other veins obscure, but forming large medial areolæ, containing a free vein, which arises from the top of a smaller costal areola, and on which the sorus is terminal. One or more small irregular areolæ lie outside the large ones. Sori in a single row on each side the

mid-rib, large, medial, round, and extending from the apex to the base of the frond. Barren frond wider, and more rounded than the fertile.

Polypodium lycopodioides. Linn.; Kze. *Linnaea*, 13, 132; Hk. and Bkr. Syn. Fil. 357; Kuhn, Fil. Afr. 149.

Pleopeltis lycopodioides. Presl.; Pappe and Rawson, 40.

Tropical America, Africa, and Islands; growing on trees and rocks.

Natal.—Coast to Inanda (Wood), Kruisfontein, Tonquat, Umbilo, Umhlatusani (M'Ken), Coast, common (Buchanan).

Var. *MACKENII*. Bkr.

Plate CXIX. Fig. 2. Natural size.

Rhizome epiphytal, flattened, and closely adherent to the tree stems, a quarter to half-inch broad, and covered with spreading lanceolate, hair-pointed, brownish, persistent scales, which afterwards become lighter in colour. Frond herbaceous or sub-coriaceous, glabrous, ovate-oblong, four to eight inches long, one to one and a half inches broad, rather obtuse at the apex, and the base rounded to the short stipe or slightly decurrent. Fertile fronds narrower. Veins and sori as in the type, but the free vein in the medial areolæ is often branched several times, with branches free, or forming small areolæ. When in active growth the rhizome sometimes extends a foot or more before fronds appear.

This was at first described as a species by Baker, but since found to be a form only of *P. lycopodioides*.

Polypodium Mackenii. Baker, Syn. Fil. 357.

Natal.—In a ravine, village of Verulam, and at Nonoti (M'Ken).

125. *POLYPODIUM AFRICANUM*. Mett.

Plate CXX. Fig. 1. Frond, natural size.

Rhizome epiphytal, running, branching, three to six inches long, one to two lines diameter, green, but covered with spreading,

ovate-lanceolate, light brown, ciliated scales, one-third inch long, which are persistent after the old fronds have fallen. Fronds two to eighteen inches long, one-half to one inch broad, alternate on the rhizome, to which they are articulated, pendent, linear-lanceolate, often falcate, thick and coriaceous in texture; the margin revolute; both surfaces at first densely covered with rufous stellate pubescence, which is permanent on the underside, though afterwards white, while from the upper surface it almost entirely disappears where exposed. Veins obscure, but in long, regular, nearly equal areolæ, with few free veins. Sori numerous, scattered all over the upper part of the frond, and nearly covered by the tomentum.

Kunze made vars. major and minor of this, but both grow together with every intermediate.

Polypodium Africanum. Mett. Polyp. 268; Hk. and Bkr. Syn. Fil. 351; Kuhn, Fil. Afr. 145.

Niphobolus Africanus. Kze. Linnæa, 10.501; Suppl. to Schk. Fil., tab. 33; Pappe and Rawson, 41.

Gyrosorium. Presl.

Tropical and sub-tropical Africa; generally on trees.

Kaff.—Cove Rock, East London (Murray, Kitton), Iquibica (Miss Crowe), Cape Morgan Forest, Kei Mouth (Flanagan), Yellow Woods Falls, on Cycads.

Natal.—Coast, rare (Wood), Dacombs Kop, Oakford, Umhloti, Umkomanzi, sources of Omoa (M'Ken), Tookey's Drift, Tugela (Buchanan).

126. *POLYPODIUM IRIOIDES*. Lam.

Plate CXX. Fig. 2. Part of frond, fertile, natural size.

Rhizome short, branching or tufted, half-inch diameter, green, with deciduous black scales, but often lost in abundant black woolly rootlets. Frond one to four feet long, two to three inches broad, lanceolate, pointed, entire, rigid, coriaceous, glabrous on both surfaces, with a very few small scattered black scales on all parts of the lower surface. There is no distinct stipe, as the very

prominent mid-rib is widely winged to the base. Venation rather obscure, but main veins run straight from the mid-rib to the margin about an inch apart; these are connected by four to six arching veins, which again are connected by small veinlets forming numerous irregular small areolæ, each containing several free veinlets. Sori abundant all over the upper part of the frond, minute, irregular, but absent from the larger veins, and thus placed in more or less arching lines between them.

A crested form is common in cultivation.

Polypodium irioides. Lam.; Hk. and Bkr. Syn. Fil. 360.

Phymatodes irioides. Presl.; Pappe and Rawson, 40.

Polypodium punctatum. Swartz.; Kuhn, Fil. Afr. 151.

Acrostichum punctatum. Linn. Sp. 7769.

Tropical India, Australia, and Africa, growing on the ground, or epiphytal on trees.

Kaff.—Mouth of St. John's River (Sir H. Barkly), Umzimvubu (Drège).

Natal.—Coast districts to Inanda (Wood), common to 500 feet alt.

(Buchanan), Palmiet River near Clare (M'Ken).

Genus XXVI. NOTHOCHLÆNA. R. Br.

Sori marginal, without indusium. Fronds two to three-pinnatifid. A small genus not naturally connected to any of the other non-indusiate genera, but closely related to *Cheilanthes*. In some of the species the margin is partly revolute over the sori, but there is no separate indusium.

Synopsis of the species.

127. *N. Rawsoni*. Frond linear-lanceolate, half-inch wide.

128. *N. inæqualis*. Frond oblong, both surfaces woolly. Crown set with reddish scales, stipe almost naked.

129. *N. Buchanani*. Frond deltoid, stipe hairy; both surfaces woolly.

130. *N. Eckloniana*. Crown and stipe paleaceous or woolly. Frond oblong, upper surface naked, or nearly so.

127. *NOTHOCHLÆNA RAWSONI*. Pappe.

Plate CXXI. Fig. 1. Natural size.

Rhizome running, one line diameter, several inches long, woody, and clothed with lanceolate, adpressed, dark scales. Frond linear-lanceolate, six to nine inches long, one-half to three-quarter inch broad, with a naked or shaggy tomentose wiry stipe three inches long, and about twenty pairs of ovate, sub-coriaceous pinnæ, which are slightly stalked below, sessile above, and divided to near the mid-rib into three to four pairs of close rounded pinnules. Pinnæ alternate, half-inch long, quarter-inch broad, glabrous on the upper surface, densely tomentose or shaggy below, and when dry all inrolled along the rachis into globules of red tomentum; rachis also red tomentose. Sori in the shag without indusium. Lower pinnæ rather smaller than those about the middle of the frond.

N. Rawsoni. Pappe; Pappe and Rawson, 43; Hk. Sp. V. 110; Hk.

Icon. Fil. cent. II. 77; Hk. and Bkr. Syn. Fil. 370.

Cheilanthes Rawsoni. Mett. Msc.; Kuhn, Fil. Afr. 75.

Endemic.—Between Spectakel and Komaggas.

Namaqualand.—Rev. Mr. Whitehead.

Specimens in Herb. Gub. are the original, and Lady Barkly says “not found since.”

128. *NOTHOCHLÆNA INÆQUALIS*. Kze.

Plate CXXII. Fig. 2. Natural size.

Crown procumbent, or forming a short rhizome, densely paleaceous. Frond oblong or oblong-deltoid, sub-coriaceous, four to six inches long, one to three inches broad, with a dark stipe three to six inches long, which is at first woolly, and afterwards naked, but furnished with a tuft of long narrow reddish scales at the base. Pinnæ opposite, the upper ovate-oblong and sessile, the lower shortly stalked, and unequally deltoid; all cut to the mid-rib

into oblong obtuse pinnules, which are either entire, or in the lower ones again pinnatifid. Upper surface more or less woolly; under surface densely clothed with rufous woolly tomentum, which when young is nearly white.

N. inæqualis. Kze. Fil. I. 146; Pappe and Rawson, 43; Hk. and Bkr. Syn Fil. 371.

Cheilanthes inæqualis. Mett.; Kuhn, Fil. Afr. 73.

South Africa only; 2000 to 2500 feet alt.

Natal.—Dry rocks with a northern aspect, Inanda (Wood), Baloochis Kraal, Inanda (M'Ken), Umpumulo (Buchanan).

Transvaal.—Magalisberg (Burke, Zeyher).

129. *NOTHOCHLÆNA BUCHANANI.* Baker ("Syn. Fil.," 373).

Plate CXXII. Fig. 1. Natural size.

Crown procumbent, paleaceous, with long linear red scales. Frond three-pinnatifid, deltoid, herbaceous or sub-coriaceous, one to six inches long, one to four inches broad, with a stipe one to four inches long, set with spreading hairs, or, when old, black and naked. Pinnæ about six opposite pairs, oblong, obtuse, pinnatifid, the upper united, the lower unequally deltoid, cut quite to the mid-rib into distinct decurrent pinnatifid pinnules, largest on the lower side. Upper surface woolly; lower surface clothed with spreading woolly light brown tomentum or hairs. Sori abundant, easily seen, marginal. Generally this appears quite distinct from *N. inæqualis*, especially in small specimens; but I have seen specimens which were almost indistinguishable, and am doubtful that they are conditional forms of one species.

Natal only. On damp rocks under shade, always with a southerly aspect, not common (Wood), Great and Little Noodsberg and Inanda (M'Ken), Umpumulo, 2000 to 3000 feet (Buchanan).

130. *NOTHOCHLÆNA ECKLONIANA*. Kze.

Plate CXXI. Fig. 2. Natural size.

Rhizome short, procumbent, hard, with lanceolate, chaffy, white or rufous scales. Frond sub-coriaceous, ovate-lanceolate, three-pinnatifid, two to eight inches long, one to two inches broad, with a stout, woolly, or paleaceous stipe, three to six inches long. Pinnæ eight to fifteen opposite pairs, ovate-lanceolate, obtuse, pinnatifid, the lower ones unequally deltoid, with several large oblong pinnatifid pinnules on the lower side. Upper surface glabrous, or at first slightly woolly; lower surface covered with short tomentum, at first white, afterwards rufous brown. Some specimens have scales on the lower surface and on the stipe instead of tomentum, in which cases the scales are like those of *Gymnogramme cordata*, or sometimes more pointed. Sporeling plants under stones have often fronds deltoid and hairy with white scales, as in *N. Buchanani*, Bkr., but afterwards change.

Nothochlæna Eckloniana. Kze. *Linnæa*, 10. 501; Pappe and Rawson, 42; Hk. and Bkr. *Syn. Fil.* 371; Wood's *Natal Ferns*, 33.
Cheilanthes Eckloniana. Mett.; Kuhn, *Fil. Afr.* 71.
Nothochlæna Krebsiana. Presl.

South Africa only; growing on or under dry stones, in sunshine.

West.—Clan William (E. and Z.), Griqualand West (Moffat), Kimberley (Dr. Marloth), Namaqualand (Drège).

East.—Krakakamma (MacOwan), Cradock (Holland), near Middleburg Road, Uitenhage, Fish River Bush, &c.

Kaff.—Beaufort, Katberg, Bolassi, Perie, Izeli, Peddie, Dohne Hill, also Komgha (Flanagan).

Natal.—Noodsberg and Richmond to Cathkin, 3000 to 5000 feet (Buchanan), The Dargle, Bishopstowe (M'Ken).

Transvaal.—Magalisberg (Burke), Trigardsfontein (Dr. Rehmann).

Genus XXVII. *GYMNOGRAMME*. Desv.

Sori oval, oblong, or linear; simple or forked; following the

course of the veins, and rising from them. This genus is an incongruous mixture of groups of plants, all connected by the nature of the sorus, but otherwise each group is more closely related to some indusiate genus, or to *Polypodium*, in which the sorus though ex-indusiate is round. These groups have been made genera by various authors, and in a natural classification must be separated; but I follow Hooker and Baker in adopting the wider genus and the sub-genera used by them in "*Synopsis Filicum*."

Synopsis of the species.

Series I. Habit of *Aspideæ*. Sori not forked.

§ *Leptogramme*. J. Sm. Veins free.

131. *G. totta*. Schl. Frond two-pinnatifid.

Series II. Habit of *Cheilanthes*. Sori usually forked.

§§ *Eu-gymnogramme*. Veins free; under surface of frond not powdery.

132. *G. cordata*. Schl. Pinnate or two-pinnatifid.

133. *G. leptophylla*. Desv. Two-pinnate or three-pinnatifid, annual.

§§§ *Ceropteris*. Link. Veins free; under surface coated with white or yellow powder.

134. *G. ochracea*. Pr. Three-pinnatifid.

135. *G. argentea*. Mett. Four-pinnatifid; powder white.

Var. *aurea*. Powder yellow.

§§§§ *Selliguela*. Veins anastomosing.

136. *G. lanceolata*. Hk. Frond simple.

131. *GYMNOGRAMME TOTTA*. Schl.

Plate CXXIII. Natural size, small.

Crown erect, stout, tufted, naked, but the undeveloped young fronds are clothed with green scales. Frond herbaceous, ovate-lanceolate, two-pinnatifid, villose in all parts, one to two feet long, three to six inches broad, with a stipe three to twelve inches long, which is villose with short deflexed hairs, and at first slightly paleaceous. Pinnæ alternate, lanceolate, two to four inches long, one-half to three-quarter inch broad, the lower slightly reduced, all cut to near the mid-rib into oblong, obtuse, oblique, crenate

pinnules, which are widest at the base, or sometimes cut only into rounded lobes along the margin. Sori medial on the veinlets, oblong or elongated along the veinlets. This has the general habit of *Nephrodium Bergianum*, Bkr., but is quite a distinct plant, and not merely an aberrant form of that fern with the fructification of *Gymnogramme*.

Gymnogramme totta. Schl. 15, tab. 6 ; Kunze, *Linnaea*, 10.495 ; Hk. and Bkr. *Syn. Fil.* 373.

Gymnogramme Loweii. Hk. and Gr. *Ic.* 138.

Phegopteris totta. Mett. ; Kuhn, *Fil. Afr.* 123.

Polypodium tottum. Willd. (not Thunberg).

Grammitis totta. Presl. ; Pappe and Rawson, 41.

Polypodium Africanum. Desv.

Asia and Africa ; growing by streams in shade.

West.—Table Mountain and Devil's Mountain (Pappe), Koratra (Drège), Knysna (Krauss).

East.—Boschberg (MacOwan), Grahamstown (Guthrie, Bolus, 1729), Bedford (Dr. Atherstone).

Kaff.—Katberg (Holland), Perie, Frankfort, Dohne, &c., frequent.

Natal.—Upland bush, not reaching the coast (Wood), 3000 to 4000 feet alt. (Buchanan), Kranzkop, Fort Buckingham, Maritzburg, and Nottingham (M'Ken).

132. GYMNOGRAMME CORDATA. Schl.

Plate CXXIV. Natural size. b. Fertile pinna.

Crown sub-erect, paleaceous. Frond lanceolate or ovate-lanceolate, pinnate or two-pinnatifid, herbaceous or sub-coriaceous, glabrous on the upper surface, densely clothed with ovate-lanceolate reddish scales on the under surface, three to eight inches long, one to two inches broad, with a short paleaceous stipe. Pinnæ ovate or ovate-oblong, the upper confluent ; the lower rounded or cordate at the base, cut halfway to the mid-rib or more (or less) into rounded, toothed, decurrent lobes. Veins flabellate in the lobes, with the oblong sori mostly nearly parallel with the mid-rib.

Rock grown specimens correspond entirely with *Asplenium Ceterach*, Linn. (*Ceterach officinarum*, Willd.), while plants grown under bush are widely different, but there is every gradation between.

In *Ceterach* the veins anastomose more or less, while in our plant they are generally free ; but plants with some veins united are not uncommon. Though there is no true indusium in this species there is a row of scales covering the sori, and the whole under surface is more or less thickly set with scales. It varies a good deal, rock grown specimens being three inches long or less, leathery in texture and densely scaly ; while under trees or bushes it becomes six to nine inches long, thinly membranaceous in texture, and with very few scales. In some specimens it is also more deeply cut than in others. It curls up when dry and again unfolds when damp in the same way as *Polypodium incanum*. Dr. Atherstone's specimens from Currie's Kloof are much more shaggy than usual with brown scales a quarter-inch long.

Gymnogramme cordata. Schl. Adum. 16 ; Hk. and Bkr. Syn. Fil. 379 ; Kuhn, Fil. Afr. 60.

Acrostichum cordatum. Thunb. Prod. 171 ; Fl. Cap. 732.

Grammitis cordata. Sp. Pl. ed. Willd. 5.142.

Ceterach cordata, Kze. Linn. 10.497 ; P. and R. 24.

Gymnogramme capensis. Spr.

Grammitis capensis. Moore.

Ceterach capensis. Kze. Linn. 10.496 ; P. and R. 23.

Ceterach crenata. Willd.

Ceterach officinarum. Pappe and Rawson, 23.

South Africa and Bourbon. P. and R.

West.—Flache Klip (Bergins), Mount Bärenkopf (Mund), Lion's Mountain (Zeyher), Clan William, Table Mountain, Dutoitskloof.

East.—Bushman's River, Uitenhage, Grahamstown (Atherstone), Sunday's River, Zwaartehodgens (Kunze), Colesberg (Holland), Graaffreinet (Bolus, 416).

Kaff.—Kat River, Winterberg (Zeyher), Komgha (Flanagan), common under bushes and at Dohne, Peddie, Yellow Woods, &c., on rocks.

Natal.—Midland and upper districts (Wood), Spring Vale, Mooi River, Cathkin, Bishopstowe, Umlaas (M'Ken), Umpumulo, 2000 to 5000 feet alt. (Buchanan).

Transvaal.—Macalisberg, Burke.

Var. NAMAQUENSIS. P. and R.

Plate CXXV. Fig. 3. Frond, nat. size. b. Pinna, magnified.

Frond lanceolate, on a longer stipe. Pinnæ all distinct, sub-coriaceous, cut throughout to the winged mid-rib into separate, roundish, flabellate, one-sided, decurrent, sub-opposite, toothed pinnules, clothed on the under side with reddish linear scales; upper side glabrous. Veins free.

Pappe and Rawson describe this as annual, but that applies to the fronds only, not to the plant.

Gymnogramme namaquensis. P. and R. 42.

Near Modderfontein, Namaqualand (Rev. H. Whitehead), Namaqualand (Scully), Great Namaqualand (Hans Schinz), Fish River (MacOwan).

Var. BI-PINNATA. Mihi.

Plate CXXV. Fig. 2. Natural size.

Frond ovate, two-pinnate, four inches long, two inches broad at the middle, with a stipe three inches long. Upper pinnæ ligulate, entire, adnate, obtuse; other pinnæ distinct, one inch long, one-third inch broad, cut to the mid-rib into entire blunt oblong lobes, of which the lower are less than the others. Upper surface glabrous, lower surface and rachis clothed with pointed brown scales. Lower pinnæ rather reduced.

The locality for this curious form which has only been seen in Mr. Holland's collection is not known with certainty, but it is thought to have been received from Namaqualand.

133. *GYMNOGRAMME LEPTOPHYLLA*. Desv.

Plate CXXV. Fig. 1. Natural size.

Plant annual, delicately herbaceous, yellowish green, with a small erect crown producing four to eight fronds. First fronds

barren, and much more foliaceous and flabellate than the more advanced fertile fronds, which are glabrous, deltoid, two-pinnate or three-pinnatifid, three inches long, one and a half inches broad, on a naked green stipe one inch or more long. Pinnæ cut to the mid-rib into distinct, cuneate, flabellate, three-fid or pinnately five to seven-fid, narrow lobes, with one vein in each, on which is placed the linear sori, mostly in the lobes but sometimes confluent below. Frond not powdered.

Gymnogramme leptophylla. Desv.; Pappe and Rawson, 42; Hk. and Bkr. Syn. Fil. 383; Kuhn, Fil. Afr. 60.

Polypodium leptophyllum. Linn. Sp. 7908; Schk. Fil. 26, tab. 26.

Grammitis. Swartz.

Widely distributed in Europe, Asia, Africa, and America; but in South Africa found only in moist vegetable soil at the Rondebosch waterfall, Devil's Mountain, where it has been collected by Mund, Dr. Alexander (1848), Browning, &c., and where it is still found.

134. GYMNOGRAMME OCHRACEA. Presl.

Plate CXXVI. Natural size. b. Fertile pinnule, enlarged.

Crown erect, tufted, paleaceous, the young unrolled fronds clothed in yellowish scales. Fronds numerous, firmly herbaceous, ovate-deltoid, acuminate, three-pinnatifid below, two-pinnatifid above, glabrous on the upper surface, coated with white powder on the under surface, one to one and a half feet long, five to seven inches broad at the base, with a furrowed brown stipe six to twelve inches long, which is dusted with white powder, and more or less paleaceous toward the base, with lanceolate spreading scales. On old fronds the powder is often wanting from the stipe, and sometimes also from the under surface, except among the sori. Rachis furrowed, slightly green-margined. Pinnæ lanceolate, widest at the base, distinct, and shortly stalked, except the upper ones which are slightly connected at the base. Lower pinnæ two to three inches long, one inch broad, cut to the mid-rib into separate

sessile, ovate-oblong, pinnatifid pinnules. Pinnæ above the middle of the frond, cut to the mid-rib only at the base into ovate obtuse, toothed or nearly entire pinnules. The pinnæ are less deeply cut upward, ending in a simply toothed blunt apex. Sori diverging obliquely from near the mid-rib into the teeth or lobes in the upper part of the pinnæ, ultimately sub-confluent, parallel with the mid-rib.

Gymnogramme tartarea, Desv., var. β *ochracea*. Hk. and Bkr. Syn. Fil. 384.

A tropical American species, not included as African by Kuhn, though he includes the closely connected *G. calomelanos*, Klf., from Fernando Po.

Natal.—(Gerrard, *vide* Hk. and Bkr. Syn. Fil.).

Transvaal.—(Herb. Bolus).

135. GYMNOGRAMME ARGENTEA. Mett.

Plate CXXVII. Natural size. b. Fertile pinnule, enlarged.

Crown erect, slender, tufted, somewhat coated with white powder. Fronds herbaceous, fragile, deltoid, four-pinnatifid, green and glabrous on the upper surface, and on the under surface coated with white or pinkish powder, which is generally very abundant, but sometimes nearly wanting. Fronds one half to two feet long, four to eighteen inches broad, with a slender naked brown stipe six to twelve inches long. Pinnæ distant, ovate pointed or deltoid, the lower ones largest, four to nine inches long, two to four inches broad, the lower pinnules on the lower side much larger than the others. Pinnules numerous, separate, shortly stalked, bluntly ovate-deltoid, decreasing in size regularly up the pinnæ, and divided to the mid-rib into separate, flabellate, bifid, trifid, or pinnatifid segments, the ultimate lobes a half-line broad, rounded at the apex, and having one veinlet each. Sori brown, linear, following the veins and meeting below.

G. argentea. Mett. MS.; Kuhn, Fil. Afr. 59; Hk. and Bkr. Ed. II. 385; Buchanan's List, No. 114.

Acrostichum argenteum. Bory.

G. conspersa. Kze. *Linnæa*, 18.116; Pappe and Rawson, 41; Hk. Sp. V. 147.

G. farinosa. Bojer MS.

G. rosea. Desv.; Hk. and Bkr. Syn. Fil. Ed. I. 385; Moore's Index, 62; M'Ken's Natal Ferns, 104.

South Africa and Mascarene Islands only; known as the silver fern, and Wood remarks that it is very difficult to transplant from the wild state.

Natal.—In the crevices of rocks near the cataract between the Omfondi and Togela Rivers (Gueinzius), rocks in damp ravines, common on Noodsberg, Isangwaan, Karkloof (M'Ken), Umpumulo rare, 3000 feet alt. (Buchanan).

Transvaal.—Drakensberg, near Macamac Gold Fields (M'Lea).

Var. AUREA. Mett.

Similar in every respect to *G. argentea*, but the powder on the under surface of the frond is bright yellow instead of white.

G. argentea, Mett., var. *aurea*. Mett. MS.; Kuhn, Fil. Afr. 59.

Gymnogramme aurea. Desv.

Acrostichum aureum. Bory.

Found in Madagascar, Angola, Bourbon, Natal, and Transvaal.

Natal.—Rare beside Iskoti, on Little Noodsberg (Buchanan), Indwedwe, north side of Umhloti, Inanda (M'Ken).

Orange Free State.—(Buchanan).

Transvaal.—Magalisberg (J. H. M'Lea).

136. GYMNOGRAMME LANCEOLATA. Hk.

Plate CXXVIII. Natural size. b. Sporeling plant.

Rhizome creeping, slender, six to twelve inches long, not wiry, but clothed with pointed, adpressed, small, dark scales. Fronds simple, entire, glabrous, thickly sub-coriaceous, or when dry flaccid, four to twelve inches long, one-half to one inch broad,

lanceolate, pointed, tapering gradually down to the base, where there is only a winged mid-rib but seldom a distinct stipe. Veins hidden, anastomosing. Sori oblong, oblique, as in *Asplenium*, immersed, medial.

It generally grows among moss on stones in deep shade, often pendent. Roots furnished with black tomentum.

This has the habit and appearance of *Polypodium lineare*, but the fronds are more succulent, and the sori elongated.

Gymnogramme lanceolata. Hk. Sp. V. 157; Hk. and Bkr. Syn. Fil. 387; Wood's Natal Ferns, 35.

Grammitis lanceolata. Sw.

Polypodium loxogramme. Mett. Polyp. No. 216; Kuhn, Fil. Afr. 148.

Asia, Polynesia, and Africa.

Kaff.—Bazija (Baur), frequent in the forests, Perie, Frankfort, &c.

Natal.—Common from Noodsberg to the Drakensberg (M'Ken), Umpumulo, Greytown, &c., 3000 to 4000 feet (Buchanan), upper and midland districts (Wood).

Transvaal.—(M'Lea).

Genus XXVIII. VITTARIA. Sm.

Sori sunk into the frond in a long line near each margin and without indusium. Frond simple, grass-like, with several veins anastomosing in young barren fronds, or united by the capsule bearing marginal veins. A small tropical genus of which we have one epiphytal species.

137. VITTARIA LINEATA. Sw.

Plate CXXIX. Fig. 1. Natural size.

Rhizome procumbent, stout, short, epiphytal, densely set with linear black scales. Frond two to twenty inches long, two lines broad, pendulous, thickly sub-coriaceous, glabrous, dark green, grass-like, with a blunt apex, prominent mid-rib, and narrowed very gradually into the firmer short green stipe. Sori in a line near each margin, often extending the whole length of the frond,

sunk into its substance without any raised edges. Veins obscure, nearly parallel, free, or united to the soriferous marginal vein, or in the rather wider and more herbaceous barren fronds of young plants forming several areolæ. Possibly young plants of this gave rise to the Cape locality for *Monogramme graminea*, Schk.

Vittaria lineata. Sw.; Schl. Adum. 33; Kze. Linnæa, 10.572; Pappe and Rawson, 38; Hk. Sp. V. 180; Hk. and Bkr. Syn. Fil. 396.

Vittaria tenera. Fée; Hk. Sp. V. 179.

Vittaria sarmentosa. Fée; Hk. Sp. V. 180.

Vittaria isætifolia. Bory; Kuhn, Fil. Afr. 55; Burchell, No. 5838.

Pteropsis angustifolia. Pappe and Rawson, 43.

Pteropsis Kuhnii. Pappe MS. in Herb. Gub.

Tænopsis. J. Smith.

Tropical Asia, America, Africa, and Islands; growing on trees and rocks in damp places, mostly near the mountain tops in South Africa; rare.

West.—Swellendam (Mund), George (Drège, Burchell, 5838), Grenadendal (Rev. Kölbing), Table Mountain, above Klaasenbosch, 2300 feet (Bolus, 4907).

East.—Amos Kloof, Grahamstown (Holland), formerly in Fern Kloof, still in Grobbellar's Kloof (Dr. Atherstone).

Kaff.—Perie, Mount Kemp, Stutterheim, &c.

Natal.—Most parts of the colony, not common (Wood), sparsely from coast to Drakensberg (Buchanan), Noodsberg, Fort Buckingham, Inanda, Krantz-kloof, Maritzburg, and Coast Bush Bluff (M'Ken).

Genus XXIX. MONOGRAMME. Schk.

“Sori linear, close to the mid-rib on one or both sides. Small grass-like or rush-like plants, the simplest in structure of all ferns.”

138. MONOGRAMME GRAMINEA. Schk.

Plate CXL. Fig. 2. Natural size.

Rhizome several inches long, half-line broad, creeping, branching occasionally, and densely set with short brown hair-like scales.

Fronds very numerous, one to three inches long, quarter-line broad, tapering to less at the base, shortly pointed, and having a distinct mid-rib throughout. The sori consist of a short line of capsules near each side of the mid-rib towards the point of the frond. This is a small grass-like plant, epiphytal on trees, credited to the Cape, but which is not in any Cape Herbarium, and only mentioned by Kuhn from the Cape on the authority of Miller ex Hooker (Sp. Fil. V. 122). It occurs in Mauritius and Bourbon, and the above description and figure are from a Mauritius specimen kindly forwarded to me from Kew.

M. graminea. Schk.; Hk. and Bkr. Syn. Fil. 375 ; Kuhn, Fil. Afr. 54.

M. linearis. Kaulf. Hk. Sp. Fil. V. 122.

Could small plants of *Vittaria lineata* have been the origin of the Cape locality for this ? The habit is similar, but the *Vittaria* is very much stronger in all parts, and never occurs with the frond so narrow as this.

Genus XXX. ACROSTICHUM. Linn.

Sori spread all over the under surface of the frond, not in dots nor lines, not confined to the veins, and without indusium.

A large genus, containing several sub-genera, of which the three represented with us are distinct enough to stand as genera ; still I follow Hooker and Baker in using the wider genus with sub-genera. Some of the *Acrostichums* occur throughout the tropics, and a few extend beyond.

Synopsis of the species.

§ Veins free, frond simple (*Elaphoglossum*. Schott).

139. *A. conforme.* Frond coriaceous, without scales, four to six inches long, one inch broad, rounded at the apex.

140. *A. latifolium.* Frond coriaceous, without scales ; one-half to two feet long, two to four inches broad, bluntly pointed.

141. *A. viscosum.* Frond firmly herbaceous, bearing at first scattered deciduous scales, not fringed, widest at the middle. Fertile frond as long.

142. *A. hybridum*. Frond herbaceous, lanceolate, fringed with scales. Fertile frond three inches long, including stipe, club shaped.
143. *A. Aubertii*. Frond thinly herbaceous, linear-lanceolate, fringed with scales. Fertile frond oblong, on a stipe eight to twelve inches long.
144. *A. spatulatum*. Frond set with hair-like scales on both surfaces. Plant much smaller than the other species.
- §§ Veins free ; barren frond pinnate, fertile frond two-pinnate (*Stenochlæna*. J. Sm).
145. *A. tenuifolium*.
- §§§ Veins anastomosing freely, with no main side veins (*Chrysodium*. Fée).
146. *A. aureum*.

139. *ACROSTICHUM CONFORME*. Sw.

Plate CXXX. Natural size.

Rhizome creeping, woody, clothed with lanceolate, pointed, large, loose, wavy scales. Fronds ligulate, rounded at the apex, rounded or tapering to the stipe, four to six inches long, one inch broad, thickly coriaceous, quite glabrous on both surfaces, very light green ; mid-rib almost white ; the margin entire but undulated ; the stipe three to six inches long, quite glabrous, nearly white. Fertile frond about equal to the barren and similar in shape. Sori filling the whole of the under surface except the mid-rib and the cartilaginous margin. Veins obscure, once forked.

Very much confusion has existed between this and the next two species. My *A. viscosum* has been repeatedly named *A. conforme*, Sw.; and the two forms of *A. viscosum* have been named *A. viscosum* and *A. conforme*. I find *A. viscosum* a quite distinct species, and easily distinguished from this ; but it is with great hesitation that I make *A. conforme* and *A. latifolium* distinct species. Kuhn makes an evident mistake somewhere in making them synonymous and including both Kunze's *A. conforme* and *A. angustatum*, while he omits *A. viscosum* from South Africa, and thus makes only one species of this group.

Lady Barkly also grouped all under *A. conforme*. Schlechtendal's *A. angustatum* is evidently this species though with a longer stipe.

A. viscosum grows more or less throughout S. Africa, but I have only seen *A. conforme* from Western Province, and *A. latifolium* from Natal. Buchanan and Wood used the name *A. conforme* for *A. viscosum*.

Acrostichum conforme. Swartz ; Hk. Sp. V. 198 ; Hk. and Bkr. Syn.

Fil. 401 ; (not Schlechtendal ; Kunze ; Buchanan ; nor Wood.)

Acrostichum angustatum. Schl. Adum. 14. tab. 5 ; Kze. Linnæa. 10.494.

Olfersia angustata. Pappe and Rawson, 44.

Elaphoglossum. Moore.

Baker and Kuhn place *Vittaria acrostichoides*, Hk. and Gr. 186 (Kze. Linn. 10.528 ; P. and R. 53), as an abnormal form of this with the sori in two sub-marginal lines.

Widely distributed in the tropics.

West.—Knysna (Eck) ; Swellendam (Zeyher) ; Voorman's bosch, Table Mountain (Bulus) ; Hottentot's Holland ; Caledon (P. & R.) ; George (Holland) ; Noord Hock, Simonstown (Lady Barkly) ; Grootvader's bosch (Zeyher).

140. *ACROSTICHUM LATIFOLIUM*. Sw.

Plate CXXXI. Natural size.

Rhizome stout, woody, creeping, thickly clothed with wavy, pointed, dark scales. Barren fronds very various, lanceolate or ovate lanceolate, widest below the middle, rounded or tapering to the stipe, and narrowed above to a blunt point ; half to two feet long, two to four inches broad, with a naked light coloured stipe two to eight inches long. Frond quite glabrous, thickly coriaceous, with hidden veins, and entire cartilaginous undulated edges. Mid-rib prominent. Fertile frond rather smaller and narrower, the under surface covered with sori except the mid-rib and edges. Very near *A. conforme*, Sw., and some Table Mountain specimens of that species approach this very closely. Kuhn makes them synonymous.

A. latifolium. Sw. ; Hk. Sp. V. 202 ; Hk. and Bkr. Syn. Fil. 403.

Natal.—On rocks ; usually in deep shade ; confined to a limited line of country, stretching from Kranzkloof through inner Inanda and Noodsberg to Umpumulo, 1500 to 2500 feet (Buchanan) ; hanging from rocks in crowded masses in midland districts (Wood).

141. *ACROSTICHUM VISCOSUM.* Sw.

Plate CXXIX. Fig. 2. Natural size, small.

Rhizome slender, woody, creeping, clothed in large, ovate, pointed, nearly black scales. Barren fronds lanceolate, acuminate, widest at the middle, and tapering slowly to a long acute point and to the stipe ; herbaceous or thinly sub-coriaceous in texture, dark green, and when young bearing scattered, ovate, membranaceous, deciduous scales, on the under surface and stipe. Barren frond six to fifteen inches long, half to one and a half inches broad ; with a firm stipe two to nine inches long, and when old nearly naked. Fertile fronds equalling the barren in height, but with shorter and narrower laminae, and longer stipe ; under surface occupied throughout with sori.

This was formerly confused with *A. conforme*, which see.

A. viscosum. Sw. ; Hk. Sp. V. 220 ; Hk. and Bkr. Syn. Fil. 406 ; McKen's Natal Ferns, 109.

A. conforme. Schl. Adum. 14 ; Kunze 10.495. (with a form *angustum* from same root) ; Buchanan's List, No. 117.

Olfersia conformis. Pappe and Rawson, 44.

Widely distributed in the tropics and sub-tropics.

West.—Devil's Mountain and Table Mountain (Bergins). Dutoits Kloof, Grenadendal (Kunze), Caledon, Swellendam (P. and R.)

East.—Amos Kloof, Grahamstown (Holland).

Kaff.—Common in bush above 1000 feet, Perie, Chumie, Frankfort, Stutterheim, Toise River, &c.

Natal.—Kranzkloof through Inanda Noodsberg to Umpumulo, and from this line to the Drakensberg, common, 1500 to 4000 ft. (Buchanan, as *A. conforme*, Sw.)

Transvaal.—Pilgrim's Rest (J. H. McLea 54, Bolus 1730)

Var. RUPESTRE. Mihi.

Plate CXXXII. Fig. 2. Nat. size.

Rhizome widely creeping, at first densely set with ovate pointed dark scales, afterwards naked. Frond one to three inches long, half to three-quarter inch broad, narrowly oval, bluntly pointed, or rounded at the apex, tapering to the stipe, subcoriaceous; both surfaces as well as the short stipe bearing numerous deciduous, ovate, membranaceous, brown scales, which soon fall off the upper surface, leaving it leathery, dark green, glabrous, and lined by the parallel veins. Fertile frond rather narrower. The extreme form which grows on exposed rocks above 4000 feet alt., looks very distinct from forest grown forms of *A. viscosum*, but every intermediate occurs at lower altitudes,

West.—Table Mountain (Bulus 3899, in part), Zwaarteberg, Caledon (Ecklon).

Kaff.—Dohne Hill, Perie, &c.

Transvaal.—Pilgrim's Rest (J. H. McLea).

142. ACROSTICHUM HYBRIDUM. Bory.

Plate CXXXIII. a. Barren frond, nat. size. b. Fertile frond, nat size.

Crown procumbent or with a short rhizome, woody, densely paleaceous, with long linear nearly black wavy scales. Barren frond lanceolate, firmly herbaceous, brittle, thin, deep green, entire, but undulated at the margin; more or less pointed at the apex, rounded below, four to twelve inches long, with a firm stipe three to eight inches long. Frond almost naked on both surfaces, but fringed all round the edge with small linear deciduous black scales, while the mid-rib on the under side as well as the stipe, are furnished at first with lanceolate, black, spreading or deflexed, deciduous scales one to one and a half lines long, which are easily rubbed off, and are often nearly wanting from old plants. Fertile frond quite different, and much smaller than the barren, one to one and a half inches long, quarter to three-eighths inch broad,

flattened when nearly mature, afterwards involute, narrower, and recurved, all soriferous, and with a more or less paleaceous stipe one to three inches long, Veins forked, parallel.

Old barren fronds from which the scales have fallen, resemble *A. viscosum* in texture, and general appearance ; but the fertile frond is quite distinct.

Acrostichum hybridum. Bory. ; Hk. and Bkr. Syn. Fil. 403 ; Kuhn. Fil.

Afr. 45 ; Wood's Natal Ferns, 37.

Elaphoglossum hybridum. Moore's Index, 358.

Tropical America, Africa, and African Islands ; growing on damp shaded rocks in wooded ravines.

West.—Paarde Krall, Knysna (Burchell, 5152 ; Kuhn).

Kaff.—Abundant in a ravine below Bayley's grave, Perie ; also sent by Mr. Ely from locality uncertain.

Natal.—Great Noodsberg, near Peel's, Umlaas, and rare at Maritzburg (M'Ken), Karkloof, 3000 to 5000 feet, and Drakensberg (Buchanan).

143. *ACROSTICHUM AUBERTII.* Desv.

Plate CXXXIV. Natural size.

Rhizome short, firm, densely clothed in rather adpressed linear brown scales. Barren frond linear-lanceolate, entire, tapering gradually to the point and to the base, thinly herbaceous, reddish green, one to two feet long, three-quarters to one inch broad, with a herbaceous stipe three to six inches long. Stipe set with numerous, spreading or reflexed, lanceolate, brown scales ; mid-rib with scattered similar scales ; both surfaces with occasional smaller scales, and the margins sparsely fringed with small linear brown scales, all more or less deciduous. Veins fine, prominent in the thin lamina, rather distant, simple or forked, not reaching the margin. Fertile frond three inches long, half-inch broad, narrowed quickly to the point and to the base, fully occupied with sori, and having a paleaceous stipe eight to twelve inches long.

Acrostichum Aubertii. Desv. ; Hk. and Bkr. Syn. Fil. 406 ; Kuhn, Fil.

Afr. 43.

Elaphoglossum. Moore's Index, 352.

South America and tropical South Africa ; growing on damp rocks and trees in deep shade.

Natal.—Peel's, Umlaas, Townhill Bush, Maritzburg (M'Ken), Karkloof (Buchanan), Little Noodsberg (Wood).

144. *ACROSTICHUM SPATHULATUM*. Bory.

Plate CXXXII. Fig. 1. Natural size.

Crown tufted, paleaceous. Barren fronds obovate cuneate, rounded at the apex, sub-coriaceous, entire, one to two inches long, quarter to half-inch broad, and tapering gradually to the slender but firm one to two inch stipe, which is set with soft, spreading, almost hair-like, brown scales, as also is the frond on both surfaces, especially round the margin. Fertile frond different, almost circular, with a crenate margin, half-inch long and broad ; the under surface filled with sori except at the margin, the upper surface hairy like the two-inch stipe. The two halves of the fertile frond fold more or less together over the sori, sometimes quite close. Veins indistinct.

A. spathulatum. Bory ; Hk. and Bkr. Syn. Fil. 408 ; Kuhn, Fil. Afr. 47.

A. piloselloides. Presl.

Tropical America, Ceylon, South Africa, and Mascarenes.

Natal.—On moist rocks open to the south, from Seven Mile Bush through Nottingham to Karkloof, 4000 to 5000 feet (Buchanan), Lyndoch (M'Ken), Ingoma, Zululand (Gerrard).

145. *ACROSTICHUM TENUIFOLIUM*. Baker.

Plates } CXXXV. Part of barren frond. Natural size.
 } CXXXVI. Part of fertile frond. Natural size.

Rhizome many yards long, one quarter inch diameter, woody. Sometimes branched, procumbent on the surface, or scandent,

green, with scattered, lanceolate, dark scales two lines long. Fronds distant; the barren pinnate; the fertile irregularly two-pinnate. Barren frond coriaceous, glabrous, glossy green, ovate-lanceolate, three to four feet long, one to one and a half feet broad, with a stipe one to two feet long, and about twenty pairs of alternate, lanceolate acuminate, shortly stalked, undulated pinnæ, which are sharply serrate along the cartilaginous margin, six to twelve inches long, and one inch broad, with a conspicuous midrib; and close, visible, parallel, free veinlets. Fertile frond three to four feet long, one foot broad, with a one to two feet stipe, and stout rachis; two-pinnate; the pinnæ one and a half inches apart, stalked, rather flaccid, four to six inches long, two to three inches broad, with numerous distinct, linear, very irregular, more or less pointed, pinnules one-half to two inches long, one line broad, covered along the under surface with sori, and after maturity all twisted into a confused mass. The rachis of the pinnæ is sometimes also fertile in part, and occasionally fertile fronds occur (on the same plants as ordinary fertile fronds) in which the fertile pinnæ are six to eight inches long, one line broad, and without pinnules, or with only an occasional one. Wood remarks—"Its rhizomes sometimes almost encircle the trees upon which it grows, and its fronds are often produced at twenty to thirty feet from the ground; the fertile fronds to be found only about January or February." The young rhizomes are sometimes several yards long before fronds are produced,

Acrostichum (Stenochlæna) tenuifolium. Baker Syn. Fil. 412.

Lomaria tenuifolia. Desv.

Acrostichum Meyerianum. Hk. Sp. V. 250.

Stenochlæna Meyeriana. Presl.; Pappe and Rawson, 43.

Lomaria Meyeriana. Mett.

Polybotrya tenuifolia. Kuhn, Fil. Afr. 52.

Mascarene Islands, and coast districts of Natal and Kaffraria.

Kaff.—Manubie Forest (J. H. Bowker).

Natal.—Common in Wet Coast Bush, reaching to Inanda, and Umsundusi Mission Station, 2000 feet (Buchanan, M'Ken).

146. ACROSTICHUM AUREUM. Linn.

Plate CXXXVII. Upper part of frond, natural size.

Crown erect, very large. Fronds pinnate, rigid, coriaceous, glabrous, three to six feet long, one foot broad, with a rigid naked stipe one to two feet long. Pinnæ oblong lanceolate, the lower shortly stalked and barren, six to twelve inches long, one to two inches broad; the upper fertile, almost sessile, four to six inches long, three-quarters to one inch broad, with a recurved margin all rounded and obtuse, or mucronate at the apex, rounded or shortly cuneate at the base, and with the margin entire. Mid-rib conspicuous; veinlets obscure, anastomosing freely into small irregular areolæ, but without any main veins, or any free veinlets. Fertile pinnæ wholly occupied with sori except the mid-rib.

Acrostichum aureum. Linn.; Hk. and Bkr. Syn. Fil. 423.

Chrysodium aureum. Mett.; Kuhn, Fil. Afr. 50.

Acrostichum inæquale. Willd.; Pappe and Rawson, 44; Kunze, Linnæa, 21.207.

Acrostichum maritimum. Gueinzus MS.

Tropics generally, including Africa.

East.—Algoa Bay (Stanger *vide* Kuhn).

Natal.—At the edge of high water at Cato's Creek (M'Ken), all round the Bay of Natal, and near Umhlali (Buchanan), Coast, in marshes and estuaries (Wood).

Transvaal.—Near Magalisberg (Sanderson).

SUB-ORDER IV.—OSMUNDACEÆ.

Genus XXXI.—OSMUNDA. Linn.

Fertile pinnæ with almost no lamina, and in our species confined to the upper part of the frond, while the lower part is foliaceous and barren. A small genus belonging to the temperate zones.

147. *OSMUNDA REGALIS*. Linn.

Plate CXXXVIII. Small frond, natural size. Fig. b. occasional fertile condition.

Crown tufted, sub-erect, often large, the young fronds clothed with yellowish woolly tomentum. Fronds two to four feet long, one to one and a half feet broad, two-pinnate, and barren for the most part, but with a changed, two to three-pinnate, fertile apex. Barren pinnæ three to six pairs, ovate-lanceolate, obtuse, glabrous, light green, herbaceous, or sub-coriaceous, eight to twelve inches long, three to four inches broad, and having six to ten pairs of rather irregular, oblong, sessile pinnæ, one to one and a half inches long, half-inch broad, obtuse at the apex, entire or minutely serrate at the edges, and rounded or somewhat lobed at the base. Fertile pinnæ shorter, and altogether different, very various; sometimes with entire, somewhat foliaceous pinnules two lines broad, and fertile only along the edges (fig. b.); but more frequently the pinnules are entirely covered with capsules on the under surface, shortly stalked, and having several round or oblong lobes connected only by the mid-rib. The fertile part soon dies down, and the fronds mostly die down in winter. They are generally two-thirds barren, but sometimes altogether barren, and occasionally two-thirds fertile; while Baker mentions having received specimens from Natal, in which the lateral pinnæ were fertile, while the terminal were barren.

Willdenow makes the South African plant a separate species (*O. spectabilis*, Willd.) differing from the European form in being more coriaceous, and having longer, and frequently lobed pinnules. Pappe and Rawson give the two forms from South Africa, but I have seen only one form, and that not sufficiently distinct to be even a variety.

Osmunda regalis. Linn.; Kunze, *Linnæa*, 10.491; Pappe and Rawson, 46; Hk. and Bkr. *Syn. Fil.* 427; Kuhn, *Fil. Afr.* 173.

O. spectabilis. Willd.; *Sp. Pl.* V. 98.

O. regalis, L., var. *spectabilis*, Kze.; Pappe and Rawson, 47.

O. capensis. Presl. (not *O. capensis*, Linn., which is *Lomaria procera*, Desv.).

Widely distributed in sub-tropical and temperate countries ; growing in damp spots, often in full sunshine.

West.—Dutoitskloof (Drège), Hottentot's Holland, Swellendam, Tulbagh (E. & Z.), Table Mountain (now eradicated), French Hock, Groot Drakenstein, George, Knysna (Lady Barkly).

East.—Zuurberg, Uitenhage (E. & Z.), Grahamstown (Holland) Brookhaagen's and Howison's Poorts (Dr. Atherstone).

Kaff.—Rare. Omsamcaba (Drège), N'cora Mountains, Cala (Mrs. Young), Bazija (Rev. R. Baur).

Natal.—Common on the coast, and frequent thence to the Drakensberg (Buchanan).

Transvaal.—Pilgrim's Rest (W. Roe ; Bolus, 1732).

Genus XXXII.—TODEA. Willd.

Sori on the under surface of ordinary pinnæ. A small genus, confined to South Africa, New Zealand, Australia, and South Sea Islands.

148. TODEA BARBARA. Moore.

Plate CXXXIX. Natural size.

Crowns sub-erect, in huge clumps, often three feet in height and diameter. Frond two-pinnate or two-pinnatifid, coriaceous, rather rigid, glabrous, ovate-lanceolate or sub-deltoid, two to four feet long, one to two feet broad at the middle, rather less below, and with a stout, naked stipe, one to two feet long. Pinnæ sessile, lanceolate, six to twelve inches long, one to two inches broad, tapering to the point, and cut to the mid-rib in the lower part into oblong, obtuse, serrated pinnules, one inch long, quarter-inch broad, with a wide adnate base ; the upper part of the pinnæ not cut quite to the mid-rib. Sori mostly on the lower pinnules ; at first more or less distinct, round or oval, afterwards confluent, and filling the whole under surface. Veinlets free, once forked.

Todea barbara. Moore's Index, 119 ; Hk. and Bkr. Syn. Fil. 427 Kuhn, Fil. Afr. 172.

Acrostichum barbarum. Linn. Sp. 7792.

Osmunda barbara. Thunb. Prod. 171; Fl. Cap. 732.

Todea Africana. Willd.; Schl. Adum. 12; Kze. Linnæa, 10.491; Pappe and Rawson, 47.

Todea rivularis. Sieber.

Sub-tropical Australia, New Zealand, and South Africa; growing in wet open places. Pappe and Rawson and Lady Barkly say common all over the colony, but it is altogether wanting from Kaffraria.

West.—Table Mountain and district, frequent.

East.—Tzitzikamma (Dr. Atherstone), near Grahamstown (MacOwan), Van Staaden's River (Browning), Krakakamma (Zeyher).

Natal.—Common from Palmiet to Inanda, Noodsberg, and Umpumulo, 2500 feet (Buchanan, Wood, M'Ken), Drakensberg (Kunze).

SUB-ORDER V.—SCHIZÆACEÆ.

Genus XXXIII.—SCHIZÆA. Smith.

Barren frond grass-like; fertile frond grass-like, with the small pinnate fertile segment at the top, the upper surface of the pinnules bearing the sessile capsules.

A most curious and distinct genus, not at all fernlike, and having only a few species; but they are widely distributed.

149. *S. tenella.* Barren fronds shorter than the fertile, which are slender, and have fertile segments less than a half-inch long, bearing five to eight pairs of short pinnules.

150. *S. pectinata.* Barren fronds equal in height to the fertile, which have fertile segment more than a half-inch long, and having ten to fifteen pairs of pinnules.

149. SCHIZÆA TENELLA. Kaulf.

Plate CXLI. Fig. 1. Natural size. b. Large fertile segment.

Rhizome tufted, or shortly running, black, naked, wiry. Barren fronds two to three inches long, quarter-line broad, flattened, pointed, twisted, coriaceous, narrowed below into a short, rigid, black, round stipe. Fertile fronds four to six inches

long, rigid, wiry, black below, green upward, glabrous, and bearing at the summit the sub-erect fertile segment, which is a quarter to a half-inch long, and has five to eight pinnules on each side, one to one and a half lines long, folded together upward, and bearing the capsules on their inner surfaces. Sometimes the pinnules are forked, and plants found above Evelyn Valley had up to twelve points on each side.

Schizæa tenella. Kaulf.; Schl. Adum. 13; Kunze, Linn. 10.439; Pappe and Rawson, 46; Hk. and Bkr. Syn. Fil. 428; Kuhn, Fil. Afr. 171.

South Africa only; growing in water.

West.—Hottentot's Holland (Zeyher), Grenadendal (Rev. C. R. Kölbing), George (three to twelve inches long).

East.—Amos Kloof, Grahamstown (Holland), Van Staaden's River (Bolus, 1542).

Kaff.—Above Perie Mission Station, and at Evelyn Valley, 4000 feet alt.

Natal.—Inyangwine, Umtwalumi (M'Ken), near Umbilo Falls (Sanderson, Wood).

150. *SCHIZÆA PECTINATA.* Smith.

Plate CXL. Fig. 1. Natural size. b. Section of stipe.

Rhizome shortly running or tufted, black, with numerous fronds, which are rigid, coriaceous, four to twelve inches high, one-half to one line broad, with a distinct mid-rib, and narrow, thick, revolute margins, and toward the base narrowed into a wiry round black stipe. Fertile segment horizontal, one-half to three-quarter inch long, three-eighths to one-half inch deep, with ten to fifteen linear or forked pinnæ on each side, folded together upwards, on the inner surface of which the capsules are placed in two lines. The fertile segment is as large on short plants as on long, and the fronds on one plant are all of equal height.

S. pectinata. Smith; Thunb. Prod. 172; Thunb. Fl. Cap. 734; Schl. Adum. 13; Kze. Linnæa, 10.493; Pappe and Rawson. 45; Kuhn, Fil. Afr. 171; Hk. an Bkr. Syn. Fil. 429.

West.—Top of Table Mountain (Thunberg), Kerstenbosch (Bergins), Drakenstein (Thbg.), Cango (Mund and Maire), Cape Flats (Rawson), Swellendam (Holland), Platteklip (Zeyher).

East.—Near Grahamstown (Atherstone), Van Staaden's River, Somerset East (MacOwan).

Natal.—(Gueinzus, *fide* Kuhn), Inanda (Wood).

Genus XXXIV.—ANEIMIA. Sw.

Fertile part of frond distinct, without lamina, much branched, rising from the base of a pinnate, leafy, barren frond. A very distinct genus, confined, with the exception of our two species, to South America and the West Indies.

151. *A. Dregeana*. Barren frond simply pinnate, villose.

152. *A. tomentosa*. Barren frond two-pinnate or two-pinnatifid, densely hairy.

151. ANEIMIA DREGEANA. Kze.

Plate CXLII. Fig. 1. Natural size.

Crown erect or sub-erect, the undeveloped fronds clothed in lanceolate scales. Stipe four to eight inches long, villose, somewhat paleaceous below, bearing one barren and two fertile fronds or divisions. Barren frond almost sessile, six to twelve inches long, one and a half to two inches broad, simply pinnate, broadly lanceolate, and bearing six to ten pairs of alternate, ovate, blunt, toothed, thinly sub-coriaceous, sessile pinnæ, one inch long, one and a half inches broad. Lower pinnæ somewhat auricled on the upper side; upper pinnæ with a shortly cuneate sub-equal base. Fertile spike three inches long, half-inch broad, on a three to four inch petiole; its pinnæ repeatedly divided into short linear segments, covered on the inner surface with capsules. Veins sub-flabellate, free. Stipe and rachis villose, under surface and veins on upper surface of barren frond slightly villose. The fertile spikes may be regarded as two transformed and fertile lower pinnæ, and Wood remarks that he has two fronds, natural sports, "one of

which with a large barren frond bears two small ones, which are fertile at the base and barren and leafy at the apex ; the other one is a barren frond with the lowest pinna on each side again twice pinnate."

Kunze made two varieties of this species, but they are not distinct.

Aneimia Dregeana. Kze. *Linnæa*, 10.493 ; Pappe and Rawson, 46 ; Kuhn, *Fil. Afr.* 171 ; Hk. and Bkr. *Syn. Fil.* 431.

Natal and Kaffraria only ; in rather dry bush.

Kaff.—Outskirts of forest below Evelyn Valley (Leighton), not uncommon at Kei mouth (Flanagan), between the Omsamwobo and Omsamcaba (Drège).

Natal.—Banks of Palmiet, and other streams behind the Berea, Inanda, Maritzburg, Noodsberg (M'Ken), Umpumulo (Buchanan), collected also by Gueinzus and Krauss (370).

152. ANEIMIA TOMENTOSA. Sw.

Plate CXLIX. Natural size.

Stipe nine inches long, firm, channelled, and bearing one barren and two fertile divisions. Barren frond two-pinnate, nine inches long, four inches broad, tapering from the base upward, and having about twelve pairs of alternate spreading pinnæ, which are one to two and a half inches long, three-quarters to one inch broad, sessile or almost so, and cut to the mid-rib into about five pairs of rather distant, alternate, oblique pinnules, half-inch long, and hardly so broad, which are somewhat decurrent on the lower side, and mostly have a wide connection with the rachis, and are more or less confluent upward. Upper pinnæ cut only halfway to the rachis. Fertile spikes shortly stalked, narrow, and cut almost similarly to the barren frond, but without lamina, and with the narrow pinnæ ascending. Whole plant set with short reddish tomentum.

A. tomentosa. Sw. ; Hk. and Bkr. *Syn. Fil.* 434 ; Kuhn, *Fil. Afr.* 171.

A. Schimperiana. Presl.

South America, Tropical Africa, and India, and collected in Natal by Sanderson, but not found since. The above description and figure are from a specimen from Caracas kindly forwarded to me from Kew.

A three to four-pinnatifid form (*A. anthriscifolia*, Schr.) has been collected in tropical Africa.

Genus XXXV.—*MOHRIA*. Sw.

Capsules marginal or almost marginal on ordinary fronds. The genus contains only the present species, which resembles a *Cheilanthes*, but has the capsules of this sub-order, and is confined to Africa and its Islands.

153. *MOHRIA CAFFRORUM*. Desv.

Plate CCLI. Fig. 2. Nat. size. 3. Capsule.

Crown erect or sub-erect, paleaceous. Fronds numerous, two-pinnate or three-pinnatifid, firmly herbaceous, bluntly lanceolate, six to eighteen inches long, one to three inches broad, with a paleaceous stipe three to six inches long. Pinnæ distant below, closer above, ovate-obtuse, one inch long, half-inch broad, with four to seven pairs of ovate pinnules, which are pinnatifid and toothed when barren, but almost entire and more confluent when fertile. Rachis and under surface more or less paleaceous. This fern seems altogether out of place here, as its habit and general appearance would place it in *Cheilanthes*, but the capsules which are very large and marginal belong to this sub-order. The upper half of the frond is the part which becomes fertile, and as the edges turn in over the capsules, it becomes more rounded and looks different. It is strongly fragrant, and known as the scented fern; and Pappe and Rawson mention that the dry fronds are pulverised, and with fat made into a cooling ointment for burns and scalds. They give the vernacular name as Brand-boschjes.

The size and scaliness of the plant vary exceedingly. Forest grown specimens have fronds sometimes two feet long, four inches

broad, and almost destitute of scales ; and there is every gradation from this, down to the dwarf rock grown specimens with fronds three inches long, three-quarter inch broad, and densely covered with reddish scales. This latter seems to agree in every respect with the description and figure of *Mohria vestita*, Bkr. (*Icones Plant*, plate 1696), from Kilimanjaro.

Another form, *M. achilleæfolia*, Lowe, which is very much cut, and has the fertile pinnæ as much cut, is represented in Dr. Atherstone's collection without locality.

Mohria caffrorum. Desv.; Kuhn, *Fil. Afr.* 171 ; Hk. and Bkr. *Syn. Fil.* 436.

Polypodium caffrorum. Linn. *Sp.* 7905.

Adiantum caffrorum. Linn.; Thunb. *Prod.* 173 ; Thunb. *Fl. Cap.* 736 (not of Swartz).

Osmunda thurifraga. Commers.; Bory.

Mohria thurifraga. Swartz.; Schl. *Adum.* 12 ; Kze. *Linn.* 10.492 ; Pappe and Rawson, 46.

Mohria crenata. Desv.

African Islands, and Africa south of the equator ; generally in damp places in the outskirts of the forests.

West.—Table Mountain, Devil's Mountain, and Lion's Mountain (Bergins), Hanglip (Mund and Maire), Tulbagh, Caledon, Dutuitskloof (Kunze).

East.—Fish River (Thunberg), Somerset East (Bolus), Bushman's River (Zeyher).

Kaff.—Katberg (Bolus, 330), Komgha (Flanagan), Main, Transkei (Mrs. Young), common in Perie, Stutterheim, Chumie, and other forests.

Natal.—Common (Wood, Buchanan, M'Ken).

Transvaal.—Magalisberg (Zeyher), near Johannesburg (D. Crawford).

SUB-ORDER VI.—MARATTIACEÆ.

Genus XXXVI.—MARATTIA. Smith.

Capsules united in a double line into a concrete sorus. Sori on the back of ordinary pinnæ. Vernation circinate. A small tropical genus, rare in South Africa.

154. *MARATTIA FRAXINEA.* Sm.

Plate CXLIV. Pinna, natural size.

Crown erect, large, irregular. Frond two-pinnate, coriaceous, glabrous, four to six feet long, two to three feet broad, with a very stout paleaceous stipe, one to two feet long, swollen at the base, and articulated to the crown. Pinnæ one to two feet long, one foot broad, with a terminal pinnule, and numerous similar opposite sessile pinnules, only slightly reduced upward, and with a margined or winged rachis. Pinnules four to six inches long, one-half to one inch broad, lanceolate, rounded below, sharply toothed along the edges, and tapering to a rather long, toothed point. Mid-rib distinct, other veins parallel, simple or forked, with clavate apices. Sori (Synangia) oblong or linear, parallel, in a straight line near the margin. Some of Baur's specimens have the pinnules pinnatifid, or rather bearing beyond their usual breadth occasional lobes half-inch long, quarter-inch broad, with several sori in each. Kuhn calls our plant *M. salicifolia*, Schr., and separates it from *M. fraxinea*, Sm., which he allows as far south as Angola and Madagascar. Most specimens have narrow pinnules, but some have them one inch broad, and the young plants I have seen in growth were so. Kuhn also places here (as sterile fronds) *Pteris cuspidata*, Thunb. (Prod. 171; Pappe and Rawson, 51; Schl. Adum, 46.

M. fraxinea. Smith, Icon. ined., tab. 48; Hk. and Bkr. Syn. Fil. 440.

M. salicifolia. Schrad.; Kze. Linn. 10.488; Schl. Adum. 11; Pappe and Rawson, 47; Kuhn, Fil. Afr. 175.

M. Dregeana. Presl.

M. Natalensis. Presl.

M. fraxinea, Sm., var. *salicifolia.* M'Ken.

Tropics and sub-tropics; growing in ravines in shade.

West.—Lakes at George (Lady Barkly, Holland).

East.—Tsitsikamma (Drège, Atherstone), Storm's River (Roth).

Kaff.—Between Omsamcaba and Omsamwobo (Drège), Bazija (Baur).

Natal.—Maritzburg (Krauss), Coast to Maritzburg (Wood), Great Noodsberg, Inanda, Zwartkop, Field's Hill (M'Ken), Umbilo Falls, Umpumulo (Buchanan).

Transvaal.—Drakensberg (M'Lea, 53).

SUB-ORDER VII.—OPHIOGLOSSACEÆ.

Genus XXXVII.—OPHIOGLOSSUM. Linn.

Fertile segment of the frond simple. A small but almost cosmopolitan genus of plants having little resemblance to ferns in general outline, and doubtless often overlooked. They are known as Adder's tongue ferns, and different authors have very different opinions as to how many species they should be divided into.

Key to the species.

§ Fertile and barren fronds distinct to the crown. (*Rhizoglossum*. Presl.)

155. *O. Bergianum*.

§§ Fertile spike single, arising from the base of the barren segment. (*Eu-ophioglossum*.)

156. *O. vulgatum*. Frond ovate, tapering to the base, with a more or less distinct mid-rib.

157. *O. reticulatum*. Frond cordate at the base, veins reticulated, without distinct mid-rib.

155. *OPHIOGLOSSUM BERGIANUM*. Schl.

Plate CXLIII. Fig. 1. Natural size.

Crown erect, not bulbous, bearing four to eight fronds; the barren and fertile fronds separate to the base; barren fronds one to three inches long, one-half to one line broad, fleshy, tapering below to a narrow yellow stipe; fertile frond one to one and a half inches long, quite linear, with quarter-inch fertile, placed quarter-inch or thereby below the point, which is sometimes linear and sometimes a flattened lamina. The fertile part has four to eight pairs of capsules, placed together. A very distinct little plant, collected many years ago as under, but not found since, till this year, when it has again been found in four localities near Cape Town by Mr. R. Schlechter.

He finds two forms, the one with a subulate leaf, and the other with a lanceolate leaf.

Ophioglossum Bergianum. Schl. Adum. 10; Kunze, *Linnaea*, 10.487;
Hk. *Icon. Pl.* plate 263; Pappe and Rawson, 48; Kuhn, *Fil. Afr.* 176;
Hk. and Bkr. *Syn. Fil.* 447.
Ophioglossum pygmæum. Bergins' MS.

Cape Colony only, and very rare; likely often overlooked.

West.—Seaside of Lion's Mountain beyond Sea Point (Bergins, Harvey,
W. C. Faure), in turf near Kuil's River (Pappe).

156. OPHIOGLOSSUM VULGATUM. Linn.

Plate CXLII. Fig. 2. Natural size. 3. Part of fertile spike, magnified,
composed of attached capsules, one above another.

Crown erect, with a few large sheathing bracts, but not tuberous. Fronds one or two from a root, four to eight inches high; the fertile part one and a half inches long, surmounted by a short point, and having a petiole one to three inches long from where it joins the barren pinnule, which is glabrous, one to three inches long, three-quarters to one and a half inches broad, ovate, pointed, or obtuse and mucronate, and tapering to the base, with a more or less distinct mid-rib, thick texture, and plain surface, or slightly reflexed edges. Frequently the petiole of the fertile segment is connected for a quarter-inch or more with the mid-rib of the barren, but sometimes they are free as far down, making the barren segment shortly stalked.

This plant varies much with situation in size, texture, form, &c., and I have great difficulty in believing that this and the next are distinct species, and not merely conditional extremes of the almost cosmopolitan *O. vulgatum*; but both are maintained by all authorities. The South African plant has even been separated from *O. vulgatum* under the name of *O. capense*, Schl., on account of its sometimes more distinct mid-rib, and this name is used by Kunze, Buchanan, Wood, and Kuhn; while Kunze, and Pappe and Rawson introduce in addition *O. costatum*, R. Br., upon this same character.

Schlechtendal separates as *O. capense*, Schl., var. β . *nudicaule*, a plant with the barren frond placed near the base of the stalk,

and makes it synonymous with *O. nudicaule*, L. I have seen no specimen answering this here ; but it is maintained by Kuhn ("Fil. Afr.," 178), as also is *O. fibrosum*, Schum. (from near Magalisberg ?), a similar plant, with thin reticulated barren fronds.

O. vulgatum. Linn. Sp. 7740 ; Hk. and Bkr. Syn. Fil. 445.

O. capense. Schl. Adum. 9, pl. 1 ; Kunze, Linn. 10.487 ; Kuhn, Fil. Afr. 176 ; Buchanan's List, No. 131 ; Wood's Natal Ferns, 40.

O. nudicaule. Pappe and Rawson, 54 (not *O. nudicaule*, Linn.),

O. lusitanicum. Thunb. Fl. Cap. 731 ; Prod. 171 (not *O. lusitanicum*, Linn.).

O. costatum. Kunze, Linnæa, 13 ; Pappe and Rawson, 48.

O. nudicaule, var. *capensis*. Mett.

Widely distributed ; growing among grass in dry banks.

West.—Table Mountain and Lion's Mountain (Thunb.), Oliphant's River (Mund and Maire), near Cape Town (Bergins), Gamka River (E. and Z.).

East.—Uitenhage (Zeyher), Kogaberg, and Bushman's River (E. and Z.), Bedford (Dr. Atherstone), top of Cave Mountain, near Graaffreinet, 4500 feet ; Net's Poort, Somerset East (MacOwan).

Kaff.—Bazija (Baur), Cathcart (Roth), near King William's Town, frequent.

Natal.—Sandy banks near Durban (Wood), Nottingham (M'Ken).

Transvaal.—Magalisberg (? see above).

157. *OPHIOGLOSSUM RETICULATUM*. Linn.

Plate CXLIII. Fig. 2. Natural size.

Crown erect, with several sheathing bracts, but not tuberous. Fronds one or two from a root, six to nine inches high, the fertile part one to one and a half inches long, surmounted by a short point, and having a petiole three to four inches long from where it joins the barren pinnule, which is glabrous, thin, cordate, pointed, somewhat involute, three to four inches long, one and a half to two inches broad, with a distinctly cordate base, and very short petiole or none. Veins distinct, reticulated, without a mid-rib. Fertile

spike longer than the barren frond. Larger and thinner than *O. vulgatum*, to which it is closely allied.

O. reticulatum. Linn. Sp. 1518; Kunze, Linnæa, 9-12; Pappe and Rawson, 48; Kuhn, Fil. Afr. 179; Hk. and Bkr. Syn. Fil. 447.

O. vulgatum, var. *reticulatum*. Mett. MS.

Widely distributed; growing in grass, or under bushes. All the specimens in the Cape Herbarium are from Natal, and Kuhn's furthest south locality is Natal, though Lady Barkly says "throughout South Africa," and Baker gives "Cape Colony."

Natal.—All over the colony (Wood), about the upper margins of bush over most of the colony (Buchanan), Cato's Creek, Durban, in Natal Botanic Garden, Umbilo near Tongat (M'Ken), Umlaas River (Krauss).

ORDER II.—EQUISETACEÆ.

Genus XXXVIII.—EQUISETUM. Linn.

The only genus in the order. Plants of very distinct habit, having no leaves, but with hollow-ribbed stems, coated with silica, rising from long solid underground rhizomes. The stems are jointed at regular distances, and at each joint the lower node is surmounted by a whorl of membranaceous teeth, surrounding the base of the next node (fig. e.). These teeth are mostly connate, except at the tips, and are equal in number to the ribs on the stem. Each rib is hollow in addition to the large central tube of the stem. In some species the stem is simple, in others similar, but smaller branches proceed in regular whorls, or, as in our species irregularly, from inside the sheath at the joints. The fertile cone is terminal on the stem or branches, and composed of numerous, peltate, many-sided, roundish receptacles (figs. b. c.), bearing on the under surface several sessile, one-celled, pouch-like capsules (Sporangia), one corresponding with each side of the receptacle, and each opening towards the centre. Spores uniform, each supplied with four hygrometric filaments known as *elaters* (fig. d.). On development the spores produce prothalia, on the under surface of which the sexual organs are to be found.

158. *EQUISETUM RAMOSISSIMUM*. Desf.

Plate CL. Natural size. b. c. Receptacles, magnified. d. Spore and elaters, magnified. e. Sheath, magnified.

Rhizome creeping, slender. Stem one to six feet long, hollow often simple and only one line diameter when small; when large varying from three to four lines diameter, irregularly branched, or sometimes irregularly whorled, with branches again sometimes branched, the terminal branch generally fertile, and often many other branches fertile, especially if the terminal one has been destroyed. Spikes one-half to one inch long, one and a half to three lines thick, oblong, pointed. Barren stems not different from the others. Sheaths two to four lines long, including the black pointed teeth, which vary in size and in number, as also do the ribs from five to twenty, according to the size of the stem. Large and small specimens look very different, and Kuhn includes the following varieties and localities from South Africa, from Milde's monograph, which I have been unable to see.

Var. *capense*, Milde=*E. capense*, Bory MS., Prom. Bon Spei (Bory, Drège, Zeyher).

Var. *Burchellii*. Milde=*E. Burchellii*, Vaucher, Prom. Bon Spei (Burchell cat., 2464).

Var. *DREGEANUM*, Milde=*E. Thunbergii*, Wickstr=*E. giganteum*, Thbg. Prod. 171.

Prom. Bon Spei (Thunberg, Drège).

Var. *ARCUATUM*, Milde.

Prom. Bon Spei, near Gekau (Drège).

Var. *FLAGELLIFERUM*, Milde=*E. incanum*, Webb and Berth. Togela River, Natal (Gueinzus).

Var. *DISTORTUM*, Milde.

Prom. Bon Spei (Mund and Maire).

Var. *NATALENSE*, Milde=*E. Natale*, Fée MS., Natal (Gueinzus).

These varieties are not separated by Baker, and the most diverse forms seem to grade into one another in accordance with surroundings.

E. ramosissimum. Desf. Flor. Atlant. II. 398 ; Buchanan's List ; Baker, Fern Allies, 4 ; Kuhn, Fil. Afr. 181.

E. elongatum (W.) Schl. Adum. 3, tab 1 ; Harvey Gen. Ed. 1, 377.

Almost cosmopolitan ; rare in South Africa ; growing in or near water.

West.—Chamka and Olifant's Rivers (Mund and Maire), Bankberg, near Baaken, on the Gareip (Drège).

East.—Sunday's River, Graaffreinet, common (Bolus), Fish River, Somerset (J. Leonard), Zwartkop River (Zeyher).

Kaff.—Matatiele (Tyson), Buffalo River near Izeli Hotel, Stream below Fort Cunynghame.

Natal.—Umpumulo, Uyr's Doorns Spruit Drift (Buchanan).

(*EQUISETUM ARVENSE*, Linn., which has the fertile stem simple, herbaceous, and evanescent, and the barren stem annual and very much branched in regular whorls, is included by Kuhn ("Fil. Afr.," 181) from Cape (Bergins). It is not known at the Cape, nor is it known at Kew as a Cape plant, and is probably a mistake.)

ORDER III.—LYCOPODIACEÆ.

Genus XXXIX.—LYCOPodium. Linn.

Capsules uniform, reniform, one-celled. A large genus, very distinct in habit from *Psilotum*, the only other South African genus of this Order, but often very similar in habit to species of *Selaginella*.

Stems dichotomously branched, procumbent or sub-erect, clothed all round, or in some species on the upper side only, with adpressed or spreading leaves. In some the capsules (Sporangia) are produced in the axils of ordinary leaves all along the stem ; in others they are confined to the upper part of the stem, or to separate spikes, terminal on the branches, and in these cases the capsule-bearing leaves are reduced to ovate bracts. The spores develop prothalia, in which the sexual organs occur.

Synopsis of the species.

§ Capsules in the axils of ordinary leaves all along the stem.

159. *L. Saururus*. Stem erect, leaves strap-shaped, one line broad, shortly pointed.

160. *L. verticillatum*. Stem pendulous ; leaves subulate, very narrow.

§§ Capsules confined to upper parts of the branches, and having bracts rather different from the leaves, but passing gradually into them.

161. *L. gnidioides*.

§§§ Capsules in short distinct spikes with bracts different from the leaves, but with ordinary leaves up to the base of the spike. Stem sub-erect.

162. *L. cernuum*.

§§§§ Capsules in distinct cylindrical or forked spikes, with changed bracts, and having a nearly leafless stalk of several inches. Leaves on all sides of the procumbent stem.

163. *L. clavatum*.

§§§§§ Capsules in a cylindrical spike on a nearly leafless stalk. Lower side of the procumbent stem leafless, and the leaves of two kinds all along the stem.

164. *L. Carolinianum*.

159. *LYCOPodium SAURURUS*. Lam.

Plate CLI. Natural size.

Stems upright, once or twice dichotomously forked, six to eighteen inches long, half-inch diameter, including leaves, and producing capsules in the axils of unchanged leaves along the stem. Leaves ligulate, half-inch long, one line broad, thickly coriaceous, entire, shortly pointed, and loosely adpressed. This is not unlike a small state of *L. gnidioides*, but the capsules are not confined to the points of the branches, nor are the leaves reduced to bracts where fertile.

L. Saururus. Lam.; Baker, *Fern Allies*, 10 ; Kuhn, *Fil. Afr.* 186 ; Buchanan's List, 27.

South America, Africa, and its Islands ; growing on stones.

Cape.—(Ecklon and Zeyher, Kuhn).

Natal.—Nottingham Bush, and Lynedoch (Buchanan).

160. *LYCOPODIUM VERTICILLATUM.* Linn.

Plate CLII. Natural size.

Stems at first upright, pendulous after they get a foot long, or less if horizontal; slender, weak, one to three feet long, two to three lines diameter, including leaves, repeatedly dichotomously forked; the terminal branches often a foot long, and unforked. Leaves set all round the stem in a spiral or sub-whorled arrangement, deep green, entire, very numerous, subulate, quarter-inch long, quarter-line broad, somewhat spreading, but with the point inflexed. Sporangia small, in the axils of ordinary leaves, abundant on the upper branches, and often produced over most of the plant, but with no distinct spike, or separate bracts.

Young plants have stems half-inch diameter, including leaves, and the leaves on them are a half-inch long, but narrow and subulate.

L. verticillatum. Linn. Suppl. 448; Pappe and Rawson, 50; Baker, Fern Allies, 14; Kuhn, Fil. Afr. 187; Buchanan's List, 27.

L. setaceum. Pappe and Rawson, 159.

On ledges of rock, or epiphytal on trees through most of the southern hemisphere.

Kaff.—Komgha (Flanagan), not uncommon in the Perie, Chumie, and Stutterheim Forests.

Natal.—Maritzburg and Umpumulo Bush (Buchanan), collected also by Gueinzus, and Plant.

Transvaal.—Macamac (M'Lea, 31).

161. *LYCOPODIUM GNIDIODES.* Linn.

Plate CLIII. 1. Fertile part, natural size. 2. Young shoot, barren, natural size.

Stem one to two feet long, two to four times dichotomously forked, stout and erect below, half-inch or more in diameter, including leaves, becoming more slender and pendulous upward; often fertile for half its length, but with the fertile part distinct,

one to two lines diameter, and with differently shaped leaves or bracts, though these pass gradually into the ordinary form where they meet. Leaves set all round the stem, but in about eight regular straight lines. Leaves thick, coriaceous, green or yellowish green, half-inch long, one line broad, blunt or shortly pointed, loosely adpressed, entire, those in the fertile portion shorter, rounder, more pointed, and scarcely larger than the very large yellow spore cases.

L. gnidioides. Linn. Fil. Suppl. 448; Schl. Adum. 7, tab. 2; Kze.

Linnæa, 10.486; Pappe and Rawson, 49; Kuhn, Fil. Afr. 184;

Baker, Fern Allies, 17.

L. pinifolium. Kaulf.; Pappe and Rawson, 49.

South Africa and Mascarenes; growing on trees or in clefts of rock in forest.

West.—George, Table Mountain (E. and Z.), Knysna (Bolus), Koretra (Drége).

East.—Grahamstown (Dr. Atherstone), Howison's Poort (MacOwan).

Kaff.—Frequent in the Perie and other forests, over 2000 feet alt.

Natal.—Inanda, Umpumulo, Maritzburg, Richmond, Karkloof, nowhere common (Buchanan).

Transvaal.—Macamac (M'Lea).

162. *LYCOPodium CERNUUM.* Linn.

Plate CLIV. Fig. 1. Natural size.

Stem three to four feet long, two to three lines diameter, including leaves, very much branched upwards, rigid, erect, and tree-like, or sub-erect and elongating like *L. clavatum*, but not rooting. Branches short, produced all round the stem at short intervals, mostly in opposite pairs; pinnately branched, with alternate, simple, dichotomous, or repeatedly dichotomous branchlets, which almost all terminate in fertile spikes. Leaves imbricated on the branches, lax and spreading on the stem, subulate, one to two lines long, with a distinct mid-rib. Fertile spikes terminal on the branchlets, a quarter to a half-inch long, one line

diameter, conical, sessile, often drooping ; bracts ovate, pointed, adpressed, ciliated.

L. cernuum. Linn.; Schl. Adum. 5 ; Kze. Linnæa, 13 ; Pappe and Rawson, 49 ; Kuhn, Fil. Afr. 183 ; Baker, Fern Allies, 23.

Widely distributed in the tropics ; growing on damp banks or among stones in sunshine.

West.—Hot springs of the Goudine (Mund), Klip River, Swellendam (Holland), Tulbagh, and Mitchell's Pass (MacOwan).

East.—Bosch Kloof (Drège), Van Staaden's River (Browning).

Kaff.—Omzambubo (Dr. Atherstone).

Natal.—Umgeni (Dr. Rehmann, 8662), common on the coast, Durban Flat to Field's Hill, Inanda, and Umpumule (Buchanan).

163. *LYCOPodium CLAVATUM.* Linn.

Plate CLV. Fig. 1. Natural size.

Stem procumbent, several yards long, pinnately branched, rooting at short intervals, generally with a long tail-like point, behind which the branches are short and simple, then dichotomous, then repeatedly dichotomous, or pinnate. Branches all more or less ascending, sometimes rooting, the lower ones very much branched, six to twelve inches long or elongating into fresh stems. Leaves finely toothed, firm, green, linear or subulate, channelled, one and a half to four lines long, loosely spreading, with the white hair point directed forward. Fertile part distinct, terminal on ordinary side branches, separated from the leafy part by a nearly naked stalk, two to four inches high, and divided into two, or sometimes into three or four, yellow shortly stalked spikes, one to two inches long, one and a half lines diameter, with spreading, ovate, pointed bracts. Roots firm, single, wiry. Common name is "Toad's Tail," or "Club moss."

L. clavatum. Linn. Sp. ; Pappe and Rawson, 49 ; Baker, Fern Allies, 26.

L. clavatum, *L.*, var. *inflexum*, Spring. ; Kuhn, Fil. Afr. 184 ; Buchanan's List, 27.

L. inflexum. Swartz.

Widely distributed in cold countries. In South Africa and other sub-tropical countries seldom below 4000 feet alt.; growing in open grassy slopes.

West.—Mountains of Hottentot's Holland (Zeyher).

East.—Boschberg (MacOwan).

Kaff.—Bethel (Zeyher), Katburg (Holland), Perie, and Mount Kemp, rare.

Natal.—Inanda, Umpumulo, Maritzburg (Buchanan) (Plant 329).

Transvaal.—Macamac (M'Lea, 19).

164. *LYCOPODIUM CAROLINIANUM*. Linn.

Plate CLVI. Fig. 1. Natural size. b. Capsule and bract, enlarged.

Stem quite prostrate, rooting at every branch, pinnately branched, three to nine inches long, and terminated by the fertile spike, or more frequently extending beyond it; leafless on the under surface, but with a row on each side of spreading, nearly horizontal, obliquely lanceolate or falcate, pointed, firmly herbaceous leaves, a quarter to half-inch long, and one line broad; and also with the upper surface thinly covered with smaller, lanceolate pointed, somewhat imbricated leaves in about three rows, which keep the direction of the stem, but are not closely adpressed, and are hardly half the size of the others. Fertile spike single, one to two inches long, two lines diameter, on a nearly naked erect stalk, two to four inches long. Bracts in regular lines, roundly ovate or sub-cordate, with a deflexed or spreading point. The growth of the stem is nearly annual, the older stem dying off during dry weather, leaving only the branches, or two to three inches of the point to start again. I have not seen more than two spikes on one plant, though Schlechtendal figures five on a plant without branches, and names it *L. repens*, Sw. There are several forms of this species, and ours is *L. sarcocaulon*, Welw., distinguished by its very large side leaves.

L. carolinianum. Linn. Sp.; Kunze, *Linnæa*, 10.485; Pappe and Rawson, 48; Baker, *Fern Allies*, 28; Kuhn, *Fil*, Afr. 183.

L. repens. Sw.; Schl. *Adum.* 5, tab. 4.

- L. sarcocaulon.* A. Br.; Welw. MS.; Kuhn, Fil. Afr. 210 (described).
L. ambiguum. Schrad.; Schl. Adum. 8; Pappe and Rawson, 53; Kuhn
 Fil. Afr. 183.
L. ericetorum. Schrad. Goett. Gel. Anz. 1818, 920.

Widely distributed; growing in open swampy sloping ground where water is constantly running.

West.—Lion's Mountain (Rev. Hesse), Attaquaskloof and Swellendam (Mund), Hottentot's Holland, and Montagu's Pass (E. and Z.), Lowry's Pass, Caledon (MacOwan), near Tulbagh (Dr. Marloth), Cedernberg, Cloofsberg (Drège), and Burchell's No. 8091.

East.—Howison's Poort, Grahamstown (MacOwan).

Kaff.—Between Omsamcaba and Omsamvubo (Drège), Evelyn Valley, 4000 feet, alt.

Natal.—Head of Bay of Natal, Inanda heights, Umpumulo (Buchanan).

Transvaal.—Magalisberg? (Burke, Kuhn).

Genus XL.—PSILOTUM. Swartz.

Capsule three-lobed, three-celled.

This genus consists of two species of curious rigid dichotomous almost leafless plants, having no resemblance to the *Lycopodiums*, but connected by the uniform spores and spore cases. Capsule three-celled, each cell splitting down its centre to discharge the oblong spores from which the prothalia are produced.

165. PSILOTUM TRIQUETRUM. Swartz.

Plate CLVI. Fig. 2. Natural size.

Rhizome wiry, creeping. Stems three-angled, six to eighteen inches long, almost leafless, very much twisted throughout, dichotomously forked repeatedly, the ultimate branches one to four inches long. The leaves are few and rigid, ovate, pointed, set on the angles of the stem, and bearing the capsules in their axils.

P. triquetrum. Swartz; Pappe and Rawson, 50.

Lycopodium nudum. Linn. Sp. 1564.

Bernhardia capensis. C. Müller.

Tropics generally, and a little beyond them; epiphytal on trees.

Natal.—(Gueinzus), on the coast, rare; bush swamp at head of Bay of Natal (Buchanan).

ORDER IV.—SELAGINELLACEÆ.

Genus XL1.—SELAGINELLA. Spring.

Plants very similar in habit to some species of *Lycopodium*, in which genus this was formerly included, and from which it is distinguished by having dimorphous spores and sporangia. Many species have procumbent rooting stems; some have erect stems from spreading rhizomes, others have the stems proceeding from a crown, while a few are annual, and erect or procumbent. In almost all the species the leaves are distichous and dimorphous, though in a few the leaves are all alike and produced all round the stem. Sporangia one-celled, two-valved, arranged in the axils of bracts in spikes terminal on the branches. The smaller kind of sporangia, which contain numerous small spores occupy the upper part of the spike, and the larger kind occupy the lower part, and contain several large spores, which on development produce a minute prothallium, on which fertilisation takes place. The habit of growth in *Isoetes* is altogether different.

Synopsis of the species.

§ Leaves set all round the stem, and all of one kind.

166. *S. pumila*. Annual, sub-erect, leaves not awned.

167. *S. rupestris*. Perennial, procumbent, leaves awned.

§§ Leaves of two kinds, one line of larger spreading leaves along both sides of the decumbent stem, and two lines of smaller ascending leaves on the upper surface. Perennials of firm texture.

168. *S. depressa*. Stem not jointed, two to three inches long, slightly branched.

169. *S. Kraussiana*. Stem jointed, six to twelve inches long, much branched.

§§§ Leaves as in the previous section. Annuals of thin texture.

170. *S. integerrima*. Leaves not ciliated at all.

171. *S. tectissima*. Leaves half-line long, strongly ciliated on the upper side at the base. Smaller leaves cuspidate. Spike half-line diameter.
 172. *S. Mackenii*. Leaves one line long, shortly ciliated on the upper side at the base ; smaller leaves not cuspidate. Spike one line diameter.
 173. *S. Cooperi*. Leaves one line long, strongly ciliated on the upper side at the base ; smaller leaves cuspidate. Spikes quarter-inch long, one line diameter.

The third section is altogether unknown to me, and the descriptions given are from Baker's "Fern Allies," as also is that of *S. depressa*.

166. *SELAGINELLA PUMILA*. Spring.

Plate CLVII. Fig. 2.-3. Forms, natural size.

Plant annual ; stems erect or sub-erect, in dense tufts ; one to four inches long, very slender, simple or slightly branched ; the branches alternate, a quarter to half inch long, and each as well as the terminal one terminated by one or two fertile spikes, a quarter to half-inch long, and one line diameter. Leaves few, scattered, all of one kind, and produced on all sides of the stem, at first green, cordate, ovate, pointed, spreading, entire, and about one line long, and half a line broad ; afterwards reflexed, yellow, and very much smaller. Bracts in regular lines ; nearly circular, with a long spreading point. Roots at the base only. Schlechtendal figures, without any difference except size, vars. *pygmæum* and *bryoides*, the latter being the larger and more procumbent plant.

Selaginella pumila. Spring. Mon. II. 60 ; Baker, Fern Allies, 35 ; Kuhn, Fil. Afr. 192 ; Herb. Norm. Austr. Afr. No. 967.

Lycopodium pumilum. Schl. Adum. 6, tab. 3.

Lycopodium pygmæum. Kaulf. ; Kze. Linn. 10.6 ; Pappe and Rawson, 49.

Lycopodium bryoides. Kaulf.

South Africa only, filling small damp mud holes ; rare and local.

West.—Sandy soil, west base of Devil's Mountain (Bergins), Hottentot's Holland (P. and R.), Paarleberg, Stellenbosch (Drège), Claremont (Marloth), Knysna Lake (Mund and Maire).

Natal.—(Drège, Kuhn), not known to Buchanan.

167. *SELAGINELLA RUPESTRIS*. Sprengel.

Plate CLIV. Fig. 2. Natural size.

Stems two to six inches long, one-half to one line diameter, including leaves, mostly procumbent, rather rigid and coriaceous, repeatedly pinnately branched, rooting freely, and growing in dense masses under stones on the top of flat rock. Leaves imbricated all round the stem, and all alike, one line long, lanceolate, ciliated, keeled, and hair-pointed; spreading when wet, adpressed when dry. Fertile spike on the lower branches, not terminal, often in pairs; half-inch long, half-line diameter, four angled, the bracts in four regular keeled rows, ovate pointed, ciliated, hair-pointed, adpressed.

S. rupestris. Spreng.; Baker, Fern Allies, 35; Kuhn, Fil. Afr. 192 and 212; Buchanan's List, p. 27.

S. rupestris, var. *Caffrorum*. Milde. Fil. Eur. 262.

Lycopodium rupestre. Linn. Sp. 1564; Pappe and Rawson, 50.

Lycopodium Dregei. Presl.

Braun (in Kuhn, "Fil. Afr.," 212) divides the African forms of this species into several sub-species receding from the American and Asiatic type; but the distinctions are too finely cut, and one patch partly in shade and partly exposed gives at least two of his forms.

He gives as South African forms:—

β. incurva. A. Br. MS. Green; stems adpressed to the ground; point of the leaves incurved, with the hair-point round upward, and denticulate at the apex. Cilia twelve to twenty; the lower long, the upper short and toothlike.

A. capensis. Cilia twelve to fifteen, hair-point quarter the length of the lamina or less; white.

B. angolensis. Cilia fifteen to twenty, hair-point more than quarter the length of the lamina; yellowish.

γ. *recurva*. A. Br. MS. Glaucous, prostrate but not adpressed; point of the leaves recurved. Cilia, ten to fifteen, spreading. Arista flattened, ciliate or toothed.

A. Dregeana. A. Br. MS. = var. *Dregei*, Milde. Leaves narrow, bristle-ciliated below.

B. Welwitschiana. A. Br. MS. Leaves wider, much recurved, bristle-toothed below.

Widely distributed in temperate regions, or on mountains in the tropics. In South Africa from 2000 to 6000 feet alt. Not recorded from West, but doubtless present on some of the rocky mountains of that region.

East.—Algoa Bay (Lehmann).

Kaff.—Windvogelsberg (Baur.), Katberg, 4000 to 5000 feet; and Witbergen, 5000 to 6000 feet (Drège), between Omsamvuba and Omsamcabo, 2000 feet (Drège), top of Dohne Hill, Bolasse, S.W. of King William's Town.

Natal.—(Plant), Umzinyati Falls, Inanda (Buch.).

Transvaal.—Houtbosch (Dr. Rehmann, 5576).

168. SELAGINELLA DEPRESSA. A. Braun.

(Description from Baker's Fern Allies, page 50.)

“Stems matted, trailing, two to three inches long, with a few, mostly simple, branches. Leaves of the lower plane spaced, spreading, oblong-lanceolate, subacute, flat, moderately firm in texture, one-twelfth inch long, more produced on the upper side of the distinct mid-rib, very cordate, strongly ciliated and much imbricated over the stem on the upper side at the base; leaves of the upper plane a third as long, ovate, little imbricated. Spikes a quarter to a-half inch long, one line diameter, not regularly square; bracts lanceolate-deltoid, a line long.

Selaginella depressa. A. Braun.

S. denticulata. Spring (exparte).

Lycopodium depressum. Sw.

Cape.—(Thunberg, Menzies), Orange Free State (Cooper).

Natal.—(M'Ken). This is quite distinct from the European *S. denticulata*, with which Spring combines it."

This is evidently rare, as Schlechtendal (Adum. 8), Kunze (Linn. 10.487), and Pappe and Rawson (53), all place it among little known or doubtful species, and Kuhn only records "Cape (Thunberg), Natal (Gueinzus) ;" while I have seen no specimens alive nor in the herbaria.

Buchanan gives "*S. denticulata*, Link., in damp parts of bush in most parts of Natal," which seems to belong to this species, as *S. Kraussiana*, Br., which is also cultivated as *L. denticulatum*, is separately mentioned by him.

169. SELAGINELLA KRAUSSIANA. A. Braun.

Plate 157. Fig. 1. Natural size.

Stem procumbent or sub-erect, herbaceous, half-line diameter, not including leaves, one to three feet long, pinnately branched, jointed at each branch, and with one root at the base of each branch. Branches ascending or procumbent, branching repeatedly in a pinnate manner, the ultimate branches often dichotomous. Leaves of two kinds, rather distant, except at the points of the branches ; the lower ones spreading, horizontal, broadly lanceolate, pointed, one to two lines long, one-half to one line broad, slightly oblique, minutely toothed all along the edges. The smaller leaves lie along the upper surface of the stem in two rows, flat, with the point upturned, lanceolate-acuminate, one line long, one-third line broad, very oblique at the base. Spikes on the lower branches, one-half to three-quarter inches long, half-line broad, four-angled from the ovate acuminate keeled bracts, being arranged in four regular rows.

S. Kraussiana. A. Braun ; Baker, Fern Allies, 65 ; Kuhn, Fil. Afr. 190.

Lycopodium Kraussianum. Kze. Linnæa, 18.114 ; P. & R. 50.

Lycopodium denticulatum. Hort. (not Link.).

Throughout Africa and African Islands, growing as a carpet on the ground under trees.

East.—Tzitzkamma (Dr. Krauss).

Kaff.—Katberg (Holland), Griqualand East, and Matatiele (Tyson), Bazija (Baur), very common in Perie, Chumie, and Stutterheim Forests, 2000 to 5000 feet.

Natal.—Near Chakaas Kraal (Gueinzus), in most parts of the colony in bush (Buchanan).

Transvaal.—Pilgrim's Rest (M'Lea).

170. SELAGINELLA INTEGERRIMA. Spring.

(Description from Baker's Fern Allies, page 66.)

“Stem trailing, very slender, reaching a length of one-half to one foot, flat on the back, bisulcate on the face, irregularly forked low down, the pinnately arranged branches distant, short, and but little compound. Leaves of the lower plane crowded and ascending on the branchlets, spaced and spreading or deflexed on the main stem, oblique oblong, subacute, one-twelfth inch long, bright or pale green, membranous, more produced on the upper side of the mid-rib, not ciliated at all, rounded on both sides at the base, but only imbricated over the stem on the branchlets ; leaves of the upper plane one-third to one-half as long, oblique ovate. Spikes square, one-quarter to one-half inch long, one to one and a half lines diameter ; bracts ovate lanceolate, strongly keeled.

S. integerrima. Spring. Mon. II. 79.

Lycopodium integerrimum. Hk. and Gr.

Lycopodium ornithopodioides. Hk. and Gr.

Ceylon. Closely allied plants have been sent from Magaliberg, Transvaal, by Sanderson ; and from Japan, Bourbon, and Chusan, but none of the specimens are in fruit, and they may be platystachyoid.”

171. *SELAGINELLA TECTISSIMA*. Baker.

(Description from Baker's Fern Allies, page 67.)

"Stems filiform, trailing, intermatted, flat on the face, one and a half to two inches long, the few short branches simple or little compound. Leaves of the lower plane spreading, contiguous or slightly spaced, ovate deltoid, acute, bright green, membranous, not more than half-line long, very unequal sided, very cordate, and strongly ciliated on the upper side at the base and much imbricated over the stem, the leaves of the opposite side considerably overwrapping each other; leaves of the upper plane half as long, ovate, with a distinct cusp. Spikes short, half-line diameter, square; bracts ovate, acute, membranous, strongly ciliated, sharply keeled.

S. tectissima. Baker in Journ. Bot., 1884, 89.

Magalisberg Mountains, Transvaal, along with the plant mentioned under *S. integerrima* (Sanderson)."

172. *SELAGINELLA MACKENII*. Bkr,

(Description from Baker's Fern Allies, page 67.)

"Stems filiform, trailing, intermatted, three to four inches long, sulcate both on back and face, forked low down, the few pinnate ascending branches simple or little compound. Leaves of the lower plane spreading, contiguous on the branchlets, spaced on the main stem, oblong, subacute, one-twelfth inch long, pale green, membranous, more produced on the upper side of the mid-rib, cordate and shortly ciliated, and a little imbricated over the stem on the upper side at the base; leaves of the upper plane half as long, oblique ovate, acute, not cuspidate. Spikes very short, square, one line diameter; bracts ovate lanceolate, membranous, strongly keeled.

S. Mackenii. Baker, in Journ. Bot. 1884, 89.

Banks of Tugela River, Natal (Gerrard and M'Ken, 237). A near ally of *S. integerrima*."

173. *SELAGINELLA COOPERI*. Baker.

(Description from Baker's Fern Allies, page 68.)

"Stems intermatted, trailing, filiform, two to three inches long, flat on the back, bisulcate on the face, the few erecto-patent branches sparingly compound. Leaves of the lower plane contiguous and ascending on the branches, rather spaced and spreading on the main stem, oblong, acute, one-twelfth inch long, membranous, rather unequal sided, cordate, and strongly ciliated and imbricated over the stem on the upper side at the base; leaves of the upper side half as long, ovate, with a short cusp. Spikes quarter-inch long, square, one line diameter; bracts ovate-lanceolate, membranous, strongly keeled in the upper half.

S. Cooperi. Baker, in Journ. Bot. 1884, 89.

Orange Free State (Cooper, 1056). Between *albo-nitens* and *integerrima*."

Genus XLII.—*ISOETES*. Linn.

Small rush-like plants, having a small bulbous crown from which rise numerous narrow linear pointed leaves, one to four inches long, containing four air tubes, and with frequent transverse partitions. The leaves widen and thicken at the base, and in their axils somewhat sunk into the base of the leaf, and often partly covered by its epidermis, is to be found the single sporangium. Sporangia one-celled, those in the axils of the outer leaves containing a few large reproductive spores, those in the axil of the inner leaves the numerous minute microspores.

The genus has no outward resemblance to *Selaginella*, nor to any other related genus. The numerous species grow in damp ground, or among water, and are distributed over America, Europe, Africa, Australia, and New Zealand.

A good many species occur in North Africa, and south to Angola, but only one has been recorded within our district, and that I have been unable to see.

174. *IOSETES NATALENSIS*. Baker.

(Description from Baker's *Fern Allies*, page 132.)

"Rootstock three-lobed. Leaves twelve to sixteen, very slender (quarter-line diameter), pale green, opaque, firm in texture, two to three inches long, rounded on the back, channelled down the face, furnished with stomata and accessory bast-bundles. Sporangium small, globose, brownish; veil none. Macrospores white, with small tubercles between the ribs, and large ones over the remainder of the surface. Microspores granulated.

Natal.—Griffin's Hill, Eastcourt (Rehmann, 7296)."

ORDER V.—*RHIZOCARPEÆ*.

Genus XLIII.—*AZOLLA*. Lam.

A curious genus of minute plants, floating on water, and having short pinnately branched stems, from the under side of which the roots depend into the water. The branches are set with short clasping leaves, somewhat distant below, abundant and closely overlapping toward the points of the branches. In the axils of the leaves are produced the two kinds of sporangia, both sessile; the larger kind roundish, and containing several or many globular stalked capsules, each containing a few microspores, the smaller roundish, with a conical point, and containing a single reproductive macrospore. The species are few, but widely distributed.

175. *AZOLLA PINNATA*. R. Br.

Plate CLVIII. Fig. 1. a. Plant, natural size. b. Point of branch, enlarged. c. Sporangium of macrospore, enlarged. d. Sporangium of microspores, enlarged.

Plant brownish, one-half to one inch long and broad, formed

of one or few fronds, each about a half-inch long and a half-inch broad at the base, and having three to five pairs of alternate branches, of which the lower are longest and again slightly branched at the tip, and the others are simple, and each one upward is shorter. Roots clustered, and with abundant rootlets.

A. pinnata. R. Br.; Kunze, *Linnæa*, 10.556; Baker, *Fern Allies*, 138; Kuhn, *Fil. Afr.* 202.

Australia, Africa, and Asia.

Natal.—In a valley near Omgeni, 100 feet alt. (Drège, *Hb. Kunze*).

Kuhn gives “Cape (Drège), Natal (Gueinzus).”

I have seen no Natal specimen, but the above description and figure are from specimens from the Niger kindly forwarded to me from Kew.

Genus XLIV.—MARSILIA. Linn.

Plants growing in water in constant pools, or where water is generally standing, but seldom in streams. Rhizomes slender, widely creeping, rooting freely, and frequently branching, producing from alternate sides petioles which, when in water, lengthen to the surface, and bear four-foliate leaves with cuneate leaflets. The stalked capsules also arise from the rhizome near the bases of the leaves, but are often only to be found on short branches from which the leaves are decayed. The capsules are oblong, two valved, opening down the front, and contain a mucilaginous cord, on which at occasional intervals are produced groups of sporangia of both kinds; those for the large spores containing only one spore, and those for the small spores many.

In habit and appearance these plants nearly resemble clover, and they are readily eaten by cattle.

Dr. Asa Gray points out that as the genus is named after Marsili, an Italian naturalist, it should be written *Marsilia* not *Marsilea*.

About forty species are described, of which nearly half are African. The size and appearance change exceedingly in accordance with water supply, as also does the amount of silky pubescence, and I am very doubtful about the following species being distinct if given similar conditions; while Kunze remarks that *M. biloba* can be found on the same plant as the more common form.

Very few specimens are in the Cape Herbaria of the first three species, and the localities given are mostly quoted from Kuhn. ("Fil. Afr." 198.)

176. *MARSILIA BURCHELLII*. A. Br.

Plate CLVIII. Fig. 2. Natural size.

Rhizome short, freely branched, with a compact habit, hairy buds, and numerous leaves upon petioles about an inch long. Leaflets narrowly cuneate, one to two lines long, half-line broad, slightly emarginate at the point, villosæ. Capsules one line long and broad, on a stipe one line long; attached to the stalk along the whole base, nearly square, but with a distinct point at the upper corner, and rounded from that to the stipe.

M. Burchellii. A. Br.; Baker, Fern Allies, 144; Kuhn, Fil. Afr. 198.

M. quadrifolia, γ. *Burchellii*. Kze. Linnæa, 10.556.

M. minuta. Burchell.

M. pusilla. A. Br.

M. pumila. Meyer.

M. filiformis. Burch. (grown in water, so rather larger).

"Cape (Drège, Burchell, 1625, 2123), Orange River (Backhouse)," Kuhn.

177. *MARSILIA BILOBA*. Willd.

Plate CLVIII. Fig. 3. Natural size.

Rhizome wide creeping, with short branches on which the numerous leaves and capsules are thickly crowded. Leaflets two to six lines long, cuneate, and divided about halfway into two linear lobes; petioles one to three inches long, slender; capsule

attached to the two to three line petiole by its whole base, somewhat ascending, nearly square, but with a point at the lower corner, and rounded at the upper corner; one and a half lines long, one line broad, and set with red silky hairs.

M. biloba. Willd. Baker, Fern Allies, 144; Kuhn, Fil. Afr. 198.

M. glomerata. Presl.

“Cape, near Mossel Bay (Meuron), (Drège, Burchell, 4444),” Kuhn.

178. *MARSILIA CAPENSIS.* A. Br.

Plate CLVIII. Fig. 4. Natural size.

Rhizome short jointed, with branches producing numerous leaves and capsules; the leaves on petioles four to six inches long. Leaflets cuneate, rounded at the point or slightly emarginate, almost glabrous, half-inch long, two lines broad. Capsules oblong-oval, one to one and a half lines long, one line broad, horizontal, slightly pointed at the lower corner, and only shortly adnate to the stipe, which is two lines long.

M. capensis. A. Br.; Baker, Fern Allies, 144; Kuhn, Fil. Afr. 198.

M. quadrifolia, var. β . Kunze, Linn. 10. 555.

M. villosa. Burchell MS. (leaves densely silky).

Common in Kaffraria in pools where the water is not constant.

“Uitenhage (E. and Z., Alexander, 50), Oliphant’s River (Mund and Maire), Kurrée (Mund and Maire, Drege, Zeyher), Natal (Robertson, 472),” Kuhn.

Natal.—Near Fox Hill, Maritzburg, Little Noodsberg, Durban Flat, Cædmore (Buchanan).

179. *MARSILIA MACROCARPA.* Presl.

Plate CLIX. Natural size.

Rhizome wide creeping, somewhat succulent, with distant leaves, on petioles four to six inches long when growing out of water, and often eighteen inches long in water. Leaflets glabrous,

on average plants three-quarter inch long, three-quarter inch broad, with a broadly cuneate base, and rounded, crenate, or occasionally emarginate, outer edge. Capsules produced mostly on shorter branches, often after the leaves are decayed, two to three lines long, one to one and a half lines broad, oval oblong, shortly pointed at the lower corner, adnate by nearly the whole base to the half-inch stipe.

M. macrocarpa. Presl.; Baker, Fern Allies, 144 ; Kuhn, Fil. Afr. 199.

M. Dregeana. A. Br.

“Cape—(Drège, E. and Z., Burchell),” Kuhn.

Kaff.—East London, King William's Town, Breakfast Vley, Frankfort, &c.

Natal.—(Baker).

Transvaal.—Pretoria (Dr. Rehmann).

APPENDIX.

SINCE the previous pages were sent to press, I have received from J. Ffolliott Darling, Esq., Umtali, Mashonaland, a parcel of ferns collected in that district, and am glad to be able to include here a list of the species sent. Mr. Darling states that these are only a first consignment, and that in future parcels he hopes to largely increase the number of species, and I have no doubt he will be able to do so. The present parcel agrees more nearly with the Natal ferns than with those of any other district, but contains several species not recorded from Natal.

1. *Adiantum caudatum*, L., with fronds hairy on both surfaces.
2. *Adiantum Capillus-Veneris*, L.
3. *Pellæa consobrina*, Hk.
4. *Pteris longifolia*, L.
5. *Pteris quadriaurita*, Retz.
6. *Pteris Aquilina*, Linn., more matted on the under surface than usual.
7. *Lomaria attenuata*, Willd.
8. *Lomaria Boryana*, Willd.
9. Incomplete—*Asplenium varians*, Hk. and Gr., or *A. Adiantum nigrum*, Linn.
10. *Asplenium cicutarium*, Sw. The lobes of the pinnules are longer and narrower than those figured by me, and belong to the type of this species; while Sanderson's Magalisberg specimens, on which only, I had previously included *A. cicutarium*, Sw., belong to var. *Abyssinicum*.
11. *Asplenium Dregeanum*, Kze.
12. *Asplenium furcatum*, Thbg., var. *tripinnatum*.
13. *Asplenium anisophyllum*, Kze.

14. *Asplenium aspidioides*, Schl.
15. *Nephrodium Thelypteris*, Desv.
16. *Nephrodium Bergianum*, Bkr.
17. *Nephrodium Filix-mas*, Rich., var. *elongatum* (grows at Umtali, nine feet high).
18. *Nephrodium cicutarium*, Baker. The specimens agree in cutting and venation with the Johanna Island specimens sent me from Kew (Plate 148), but differ in having the upper surface of the frond thinly but regularly set with small roundish scales ; the rachis shortly pubescent, and the upper part of the costa and pinnæ mid-ribs bearing numerous adventitious buds on the upper surface.
19. *Nephrodium*. Three-pinnate or decompose, barren and incomplete, but distinct from any species hitherto recorded from South Africa.
20. *Nephrolepis exaltata*, Schott. This species resembles *N. biserrata*, Sch., in general outline, but is smaller in all parts, the frond being only one to two feet long, and two to three inches broad, while the pinnæ are about an inch long, half-inch broad, and minutely serrate along the margin. It was found by Oates in Matabeleland, but has not yet been recorded outside the tropic.
21. *Osmunda regalis*, Linn.
22. *Mohria caffrorum*, Desv.
23. *Marattia fraxinea*, Smith, with narrow pinnules.
24. *Selaginella Kraussiana*, A. Br.
25. *Selaginella* (incomplete), possibly *S. Cooperi*, Bkr. The leaves are however ciliated or serrated all round, especially towards the point, as also are the smaller leaves and bracts. The smaller leaves have a long toothed point, and the very short spikes are abundant and terminal upon every branchlet. The habit seems to be sub-erect, with roots from the lower half only, but better specimens are required to fully identify this.

E R R A T A.

Page 17, Lines 10 and 11, and elsewhere, for Bergins, *read* Bergius.

Page 29, Line 3, and elsewhere, for Maserenes, *read* Mascarens.

Page 269, after Systematic Index, insert :—

NOTE.—Names of Species are printed in *Italics* ; all others in Roman text are Synonyms.

Page 275, Line 17 (from foot), under Trich. pusillum, for Pl. 4, *read* Pl. 6.

Page 275, Line 15 (from foot), under T. quercifolium, for Pl. 4, *read* Pl. 6.

GENERAL INDEX AND GLOSSARY.

Acuminate, taper pointed.	
Adnate, connected for some distance.	
Adpressed, lying close alongside.	
Adventitious buds, buds produced in abnormal positions.	
Anastomosing, uniting so as to form a network.	
Areolæ, the spaces enclosed by anastomosing veins.	
Arista, a bristle point.	
Articulated, having a distinct joint.	
Ascending, with the point tending upward.	
Atherstone, Dr., of Grahamstown.	
Attenuate, drawn out to a long point.	
Auricle, an ear-like lobe, generally at the base of a pinnule.	
Baker, John Gilbert, F.R.S., F.L.S.	23
,, in Annals of Botany	23
,, Handbook of Fern Allies	23
Barkly, Lady, revised list of Cape ferns	21, 24
Bergins, C. W., see "Plantarum Capensium descriptiones ex Schedis Bergianis," in Linnæa, Vol. 1., Berol. 1826, pp. 250-258, by Schlechtendal	17
Bergins, P. J., "Descriptiones Plantarum e Capite Bonæ Spei, Holmiæ, 1767," and Act. Petrop. 1782	17
Bkr., J. G. Baker	23
Bi-pinnate	5
Bolus, H., F.L.S., Cape Town	27
Bory de St. Vincent.	
Bracts	241
Brehm, Dr., resided in Uitenhage	35
Browning, Novara Expedition.	
Br., or R. Br., R. Brown, mostly in Prod. Flor. Nov. Holland.	
Buchanan, Rev. John, revised list of Natal Ferns	21, 25
Buds	8
Burchell, W. J.	18
,, Geographical Catalogue	23
Burke, travelled with Zeyher in Transvaal	19
Capsule	I, 5, 9
Candex, a tree-like stem.	

Cells	3
Cellular cryptogams	3
Channelled, having a groove down the front.	
Ciliated, margin fringed with hairs or scales.	
Circinate vernation	2
Classification	36
Compressed, somewhat flattened.	
Confluent, partly united at the base.	
Connate, united below.	
Contracted, narrowed.	
Cordate, heart shaped.	
Coriaceous, leathery.	
Costa, mid-rib.	
Crenate, having shallow rounded teeth.	
Crown	4
Cryptogams	2
Cultivation	10
Cuneate, wedge shaped.	
Cuspidate, short pointed.	
Deciduous, falling off at regular seasons.	
Decurrent, having a wing continued some distance down the stem.	
Deflexed, bent downward.	
Deltoid, triangular.	
Denticulate, toothed.	
Desv., Desvaux Ann. Linn. VI.	
Dichotomous	5
Dimorphous, occurring in two forms.	
Distichous, two-ranked.	
Distribution	27
Districts	28
Divergent, spreading in different directions.	
Dorsal, on the back.	
Drainage	11
Drège, J. F.	19, 23
East District	28
Ecklon, C. F.	19
E. and Z., Ecklon and Zeyher	23
Elater	239
Emarginate, notched at the apex.	
Endemic, confined to a particular country.	
Entire, not toothed.	
Epiphytal, growing upon trees or rocks like parasites, but living on the atmosphere only.	

Erecto-patent, nearly horizontal both from and across the rachis.	
Exserted, extending outside.	
Falcate, sickle shaped.	
Fèe, Genera Filicum.	
Ferns of African Islands	34
Fertilisation	7
Feruginous, rusty brown.	
Fibrillose, having long narrow fibre-like scales.	
Filament	239
Filiform, long and narrow, like a hair.	
Flabellate, fan shaped.	
Flaccid, limp.	
Foliaceous, leafy.	
Forsk, Fl. Æq. Arab. 1775.	
Free veins, veins not anastomosing.	
Frond	5
Gerrard, W. T., formerly resident in Natal.	
Glabrous, without hairs.	
Glands, enlarged cells, often on the top of jointed hairs.	
Glandular hairs, hairs bearing glands.	
Glaucous, sea-green colour.	
Harvey's Genera of Cape Plants	19
" " " 2nd edition	20
Hastate, halbert shaped with two tails.	
Herbaceous, with soft green lamina, <i>i.e.</i> not leathery.	
Herbarium	16
Herb. Gub., Government Herbarium, Cape Town	23
Herbarium Normale Austro-Africanum	24
Hooker, Filices Exoticæ	20
Hooker, Genera Filicum	19
" Icones Plantarum	21
" Species Filicum = Hk. Sp.	19
Hk. and Arn., Hooker and Arnott.	
Hk. and Bkr., Hooker and Baker Synopsis Filicum	20
" " " " " 2nd edition	21
Hk. and Gr., Hooker and Greville Icones Filicum.	
Icon. Plant., Hooker's Icones Plantarum	21
Identification	15
Imbricated, closely overlapping.	
Immersed, sunk in the substance of the frond.	
Indusium	5
Inflexed, turned inward.	
Intra-marginal, a short distance within the margin.	

Involucre	5
Involute, rolled inward.	
Involved, rolled inward.	
Kaffrarian District	28
Karoo	28
Klf., Kaulfuss Enumeratio Filicum.	
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Krauss, Dr. F., collection	23
Kuhn, Filices Africanæ	20
Kze., Prof. Kunze, of Leipzig.	
Kze. Linn., Kunze in Linnæa	19
Kunze, Die Farnkreuter in Colorirten Abbildungen	19
Laciniated, much cut.	
Lamina, the green leafy part of a frond.	
Lanceolate, lance shaped.	
Lax, scattered, or thinly placed.	
Ligulate, strap shaped.	
Linear, long and narrow, and of equal width.	
L. or Linn., Linnæus	17
Linnæa	19, 23
Linn. Sp. Pl., Linnæus, Species Plantarum.	
Linn. Syst. Veg., Linnæus, Systema Vegetabilium, 1774.	
Lowe, Ferns, British and Exotic	20
Macrospores, the larger kind of spores among Fern Allies.	
Marginal, along the margin.	
M'Ken's Ferns of Natal	20
Membranaceous, thin like a membrane.	
Mett., Mettenius	20
Microspores, the smaller kind of spores among Fern Allies.	
Milde, Filices Europææ, and Monograph of Equisetum	240
Moore's Index Filicum	20
Mueller, Baron Ferd., Second Census of Australian Plants	34
Mund and Maire	18
Naked, without scales.	
Oates' Matebeleland	21
Oblong, rather longer than wide.	
Obovate, the shape of an inverted egg.	
Obtuse, blunt.	
Paleaceous, set with scales.	
Palmate, hand shaped.	
P. and R., Pappe and Rawson, Synopsis Filicum Africæ Australis	19
Peltate, fixed by the centre.	
Permanent, not changeable.	

Persistent, not falling off.	
Petiole, the stalk of a pinnule or frond.	
Phanerogams	2
Pinna	5
Pinnate	5
Pinnatifid	5
Pinnule	5
Plane, flat with the rachis.	
Preservation	15
Presl, Tentamen Pteridographiæ	19
Proliferous, producing adventitious buds.	
Propagation	7
Prothallus	7
Pubescence, soft short hairs.	
Pubescent, clothed with soft short hairs.	
Rachis	5
Rawson, Hon. R. W. R.	19
Receptacle	6
Reduced, smaller.	
Rehmann's, Dr., collection	23
Reniform, kidney shaped.	
Reproduction	7
Reticulated, netted.	
Revolute, rolled back.	
Rhizome	4
Root	4
Rufous, rusty-red.	
Scales, protective appendages wider than hairs.	
Scandent, climbing.	
Scarious, having a firm, thin, white margin.	
Schinz, Hans., Transvaal Plants	22
Schk. Fil., Schkuhr Icones Filicum.	
Schlechtendal, Prof.	19
Schl. Adum., Schlechtendal Adumbratio Filicum	19
Schrader's Götting Gel. Anzeig.	18
Schrader's Journal für die Botanik	18
Segments, the lobes of a pinnule.	
Serrate, toothed with the teeth pointing forward.	
Sessile, not stalked.	
Sim, Handbook of Kaffrarian Ferns	22
Simple, undivided.	
Sinuate	5
Sinus	5

Smith, John, of Kew.	
Smith, Sir J. E., Author of English Flora.	
Sorus	5
Sparrmann	17
Spathulate, circular at the apex and tapering to the base.	
Sporangium	239, 241
Spores	1, 6, 7
Spr., Systema Vegetabilium, Linnæus, Ed. 16, edited by Sprengel.	
Spring, in Memoires de l'Academie Royal de Belgique	23
Spurious venules, venules not connected with the main vein system.	
Stalk	5
Stellate, star shaped, or with radiating arms.	
Stipe, the stalk of a fern frond.	
Subtended, extended under.	
Subterranean, underground.	
Subulate, awl shaped.	
Summary of distribution in districts	33
Superficial, on the surface, <i>i.e.</i> not immersed.	
Suppl. to Schk. Fil., Supplement to Schkuhr's Icones Filicum by Kunze.	
Sw., Swartz, O., in Schrader's Journal für die Botanik	18
Syn. Fil., Synopsis Filicum, Hooker and Baker, 2nd Edition	21
Tomentose, shaggy with tomentum.	
Tomentum, intermatted woolly hairs.	
Tripinnate	5
Thunberg, C. P.	17
Thbg. or Thunb. Fl. Cap., Thunberg, Flora Capensis	19
Thbg. or Thunb. Prod., Thunberg Prodrum Plantarum Capensium	17
V. D. B., Van Den Bosch.	
Vascular cryptogams	1, 3
Veinlets, the small ultimate veins.	
Veins	5
Veins free, veins not anastomosing.	
Venation, the arrangement of the veins.	
Venules, very small veins.	
Vernation	2
Vessels	3
Villose, with rather long soft hairs.	
West district	28
Willd., Species Plantarum, Linnæus, 4th Edition, edited by Willdenow, 1797-1830	17
Zeyher, K. L. P.	19

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<i>falcatum</i> , Thbg.	137			<i>Azolla pinnata</i> , R. Br.	256	41	158
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<i>vestita</i> , Bkr.	234			<i>Ophioglossum Bergianum</i> , Schl.	236	236	143
<i>Monogramme</i> , Schk.	217	39		<i>Capense</i> , Schl.	238		
<i>Monogramme graminæa</i> , Schk.	217	39	140	Var. <i>nudicaule</i> , Mett.	238		
<i>linearis</i> , Kaulf.	218			<i>costatum</i> , R. Br.	237		
<i>Myriopteris contracta</i> , Fée	85			<i>fibrosum</i> , Schum.	238		
<i>induta</i> , Fée	88			<i>lusitanicum</i> , Thbg.	238		
<i>intermedia</i> , Fée	85			<i>nudicaule</i> , P. and R.	238		
<i>Nephrodium</i> , Rich.	171	39		<i>nudicaule</i> , Linn.	238		
<i>Nephrodium albo-punctatum</i> ,				Var. <i>capensis</i> , Mett.	238		
Desv.	173	172	95	<i>pygmæum</i> , Berg.	237		
<i>athananticum</i> , Hk.	183	173	102	<i>reticulatum</i> , Linn.	238	236	143
<i>Bergianum</i> , Bkr.	175-262	172	96	<i>vulgatum</i> , Linn.	237	236	142
<i>Buchananii</i> , Bkr.	184	173	103	Var. <i>reticulatum</i> , Mett.	239		
<i>catopteris</i> , Hk.	185	173	104	<i>Osmunda</i>	226	39	
<i>ciutarium</i> , Bkr.	187-262	173	148	<i>Osmunda barbara</i> , Thbg.	229		
<i>conterminum</i> , Desv.	174			<i>Capensis</i> , Linn.	123		
<i>crenatum</i> (Forsk.) Mihi	186	173	105	<i>Capensis</i> , Pr.	227		

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<i>Osmunda polypodioides</i> , Sw.	118			<i>Polypodium</i> Var. γ . <i>Schraderi</i> (Mett.)	199	191	115
<i>regalis</i> , Linn.	227-262		138	Var. β . <i>simplex</i> (Sw.)	198	191	
Var. <i>spectabilis</i> , Kze.	227			loriforme, Wall.	198		
<i>spectabilis</i> , Willd.	227			loriforme, Hk.	200		
<i>thurifruga</i> , Bory.	234			loxogramme, Mett.	216		
<i>Osmundaceæ</i>	226	39		<i>lycopodioides</i> , Linn.	202	192	119
<i>Pæsia</i> , St. H.	106, 114			Var. β . <i>Mackenii</i> (Bkr.)	203	192	119
<i>Pellæa</i> , Link.	90	38		<i>Mackenii</i> , Bkr.	203		
<i>Pellæa andromedifolia</i> , Fée	98			Natalense, Pr.	180		
<i>auriculata</i> , Link.	91-97	90	32	<i>normale</i> , Don.	199	191	116
Bojeri, Hk.	97-100			Var. β . <i>longifrons</i> , Wall.	200		
<i>Boivini</i> , Hk.	98	91	146	<i>obtusilobum</i> , Desv.	175		
<i>Burkeana</i> , Bkr.	105	91	35	<i>Pappei</i> , Mett.	200		
<i>calomelanos</i> , Link.	104	91	41	parasiticum, Linn.	178		
<i>consobrina</i> , Hk.	97-261	91	36	pectinatum, Forsk.	174		
<i>deltoides</i> , Bkr.	94	90	34	<i>Phymatodes</i> , Linn.	196	191	113
Var. <i>laxa</i> , Mihi	94		34	<i>proliferum</i> , Pr.	192	191	108
<i>geraniifolia</i> , Fée	92	90	33	punctatum Sw.	205		
<i>hastata</i> , Link.	101	91	33	Schraderi, Mett.	199		
Var. <i>glauca</i> , Sim	100-102		40	<i>simplex</i> , Sw.	198		
Var. <i>macrophylla</i> (Kze.)	102		39	sinuatum, Mihi	202		
<i>involuta</i> , Bkr.	100	91	37	speluncæ, Linn.	64		
<i>lanceifolia</i> , Bkr.	96	91	31	tottum, Thbg.	180		
<i>leucomelas</i> , Bkr.	103	91		tottum, Willd.	210		
<i>Nanaquensis</i> , Bkr.	99	91	26	<i>unitum</i> , Hk.	193	191	109
<i>pectiniformis</i> , Bkr.	95	91	35	<i>vulgare</i> , Linn.	193	191	110
<i>profusa</i> , J. Sm.	96-101			<i>Zeyheri</i> , Sieb.	201		
<i>robusta</i> , Hk.	95	91	34	<i>Polystichum</i> , Roth.	165		
<i>viridis</i> , M'Ken	102			<i>Polystichum angulare</i> , P. and R.	167		
<i>Phegopteris</i> , Mett.	190			coriaceum, Sch.	169		
<i>Phegopteris totta</i> , Mett.	210			luctuosum, P. and R.	168		
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<i>Phymatodes elongata</i> , Pr.	199			<i>Psilotum triquetrum</i> , Sw.	247	40	156
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irioides, Pr.	205			<i>Pteris adiantoides</i> , Bory.	103		
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<i>Physematium</i> , Kze.	61			Var. <i>lanuginosa</i> , Hk.	114		
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<i>Pleopeltis concinna</i> , Pappe	200			<i>arguta</i> , Ait., var. <i>flabellata</i> , Mett.	111		
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<i>lycopodioides</i> , Pr.	203			<i>biaurita</i> , Linn.	109	106	
<i>Polybotrya tenuifolia</i> , Kuhn	225			<i>Buchanani</i> , Bkr.	111	106	46
<i>Polypodiaceæ</i>	57	36		<i>Burkeana</i> , Hk.	105		
<i>Polypodium</i> , Linn.	190	39		Caffra, Pappe	111		
<i>Polypodium aculeatum</i> , Thbg.	167			<i>calomelanos</i> , Sw.	105		
<i>Africanum</i> , Mett.	203	192	120	Capensis, Thbg.	97-114		
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<i>Australe</i> , Fée	194			concolor, L. and F.	93		
<i>Australe</i> , Mett.	194			confluens, Thbg.	92		
Bergianum, Schl.	176			consobrina, Kze.	97		
Caffrorum, Linn.	234			coriifolia, Kze.	114		
Capense, Linn.	60-169			costata, Bory.	107		
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crenatum, Forsk.	186			cuspidata, Thbg.	107-235		
Ecklonii, Kze.	195			dichotoma, Kuhn	164		
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Guinzii, Mett.	198			ensifolia, Sw.	107		
<i>incanum</i> , Sw.	194	191	111	<i>flabellata</i> , Thbg.	110	106	45
<i>irioides</i> , Lam.	204	192	120	<i>flabellulata</i> , Thbg.	111		
<i>lanceolatum</i> , Linn.	201	192	117	geraniifolia, Raddi	93		
Var. <i>sinuatum</i> , Mihi	202	192	118	glabra, Kuhn	76		
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